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GREEN INDUSTRY NEWS

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VIEWPOINT

Ron Morris, Technical Editor

"MONSTER BUG" ATTACKS!

Last year it destroyed $45 million worth of cotton, this year it could be $74 million worth of lettuce. Front page news. Government issues emergency permits on chemicals deadly to fish, mildly toxic to animals.

Really sounds like the government knows what it is doing, doesn't it? I was concerned with writing about 2,4,5-T, the infamous "Agent Orange" — which we all know it really isn't — but front page news tends to detract from the issue at hand.

I am against use of unknown, deadly to fish, toxic to animals, types of chemicals. On the other hand I am all for use of chemicals that have been run through the scientific world and many, many facts are known to prove their use reasonably safe.

So, if scientists think the stuff is safe when used as directed, why the furor over 2,4,5-T? Is Rivera a scientist? B — a reporter? C — an instigator? Granted, Agent Orange could've been dangerous. It was a combination of highly volatile esters of 2,4-D and 2,4,5-T, sprayed at extremely high rates. 3,000 to 30,000 times the rate that 2,4,5-T is used on forests by the forest service today. It could've caused grotesquely abnormal children and miscarriages, but if that is so, then the scientists who went to investigate and said that, in the aftermath, the rates for that type of thing were below normal for that area are downright blatant liars.

Dioxin, the most deadly poison known, and Agent Orange, have clouded the issues. It is no longer scientific, but now becomes a scare issue. So scary in fact, that EPA refuses to issue a water tolerance level.

In 1976, a reactor in Italy expolded, exposing resident of a small town north of Milan to TCDD, a member of the dioxin family. According to Dow Chemical company, TCDD concentrations were reported in medical journals as 1 million times greater than those that occur from agricultural treatments with 2,4,5-T. There were no embryonic malformations found in thirty women who underwent therapeutic abortions, nor were there any cases of severe human illnesses.

To sum it up, in my opinion, the EPA has let the issue become one of emotions. That should not be the case. EPA should be concerned with reporting scientific data on the toxicity of materials, determined by scientific methods by scientists. This data should stand on its own. If the data shows it is toxic at a certain level, then that level should not be reached in any application.

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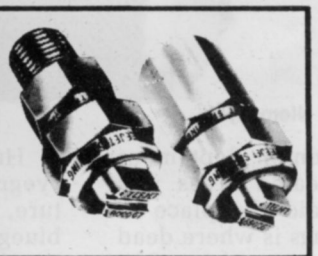

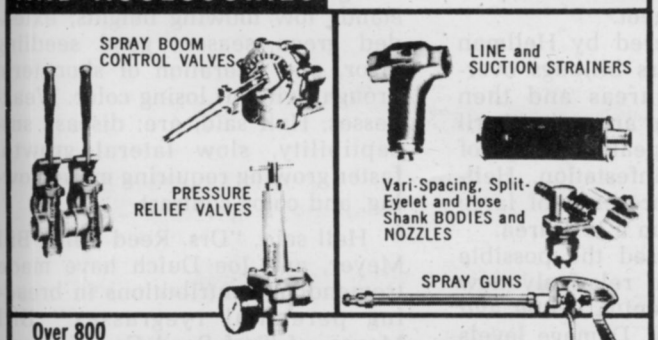

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GREEN INDUSTRY NEWS

TURF

Lawn care growth evident at Ohio Turf Show

Lawn care appeared to dominate other turf interests at the Ohio Turfgrass Conference and Show in Columbus, Dec. 5-7. Dave Martin, OTF executive director, said that there were more representatives from lawn care companies than golf courses, and this was only the second year separate sessions for lawn care were offered. More than 1,500 turf managers attended the three-day event which enjoyed good weather for a change.

Chemicals and business dominated the lawn care sessions. Late fall fertilization and turf insect control drew large crowds. Dr. J.R. Hall of Virginia Polytechnic Institute and State University said supplying nutrients to bentgrass, after temperatures stay below 55 degrees but before the grass goes dormant, enables the grass plants to build up carbohydrate reserves for the flush of growth in spring. Early spring fertilization can cause carbohydrate depletion in root systems by June, Hall said, because of excessive shoot growth. Hall recommended use of soluble nitrogen for late fall fertilization. His data was limited to a band across the center of the U.S. from the East Coast to the Midwest. A fertilization program where one pound of nitrogen is applied in October, November, December, January and February was recommended.

Drs. Niemczyk of the Ohio Agricultural Research and Development Center and Hellman of the University of Maryland spoke on turf insect control. Niemczyk reported data from tests on chinchbugs and treatment timing, the ataenius beetle, and the greenbug aphid.

Both Niemczyk and Hellman compared treated and untreated chinchbug areas. Niemczyk showed that an April application of Dursban controlled chinchbug damage throughout the year, although chinchbug migration in September into previously treated areas was found. Hellman said the place to check for chinchbugs is where dead and healthy turf meet.

Dr. Harry Niemczyk

Dr. John R. Hall, III

Other tips offered by Hellman were that bluegrass billbugs overwinter in shady areas and then migrate into open areas in April when populations peak. One sign of a sod webworm infestation, Hellman said, is the presence of large numbers of birds on a turf area.

Niemczyk stressed the possible seriousness of two relatively new turf pests, the ataenius beetle and the greenbug aphid. Damage levels from both pests have showed markable increases.

Business sessions, including a four-member panel on starting a lawn care business, also received good attendance. Subjects covered were business expansion through diversification, cash management, and computers for routing and billing.

Perennial ryegrasses and proper overseeding were covered in both lawn care, golf course, and general sessions.

Hall said strengths of perennial ryegrasses include: medium texture, blends well with Kentucky bluegrass, fast germination, withstands low mowing heights, extended green season, good seedling vigor, and toleration of short-term drought without losing color. Weaknesses, Hall said, are: disease susceptibility, slow lateral growth, faster growing requiring more mowing, and color contrast.

Hall said, "Drs. Reed Funk, Bill Meyer, and Joe Duich have made tremendous contributions in breeding perennial ryegrasses." Bill Meyer, of Turf Seed Co. and Pure Seed Testing in Hubbard, Oregon, spoke to the Golf Course session on Turfgrass Varieties for Overseeding Golf Courses.

Other golf course topics were redesigning greens by Dr. Mike Hurdzan, managing *Poa annua* by Bill Burdick, and sand topdressing by a panel of three superintendents.

The panel pointed out that once sand topdressing is started, it must be maintained or else a layering effect will retard water percolation.

Technical and Instructional Books

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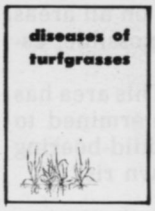

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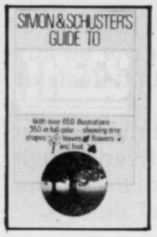

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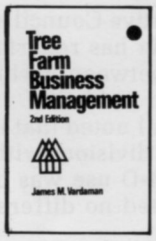

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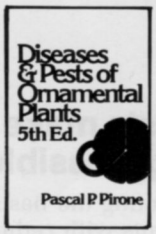

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GOVERNMENT UPDATE

2,4,5-T warnings suggested

Counselors of the Environmental Defense Fund, the National Audubon Society and the National Wildlife Federation have signed a letter to the EPA suggesting that a warning be posted on all areas sprayed with 2,4,5-T where human reentry might be possible, especially recreation sites.

An example of the suggested warning is: "Warning! This area has been sprayed with 2,4,5-T. This product has been determined to cause birth defects in laboratory animals. Women of child-bearing age should not enter posted area and do so at their own risk."

Australia finds no 2,4,5-T, birth defects link

A Consultative Council appointed by the Minister of Health, Victoria, Australia has reported that there does not appear to be any relationship between herbicide usage and type of birth defects or deaths related to birth.

The Council noted that it had compared birth defect numbers in two statistical divisions with similar numbers of births. Even though 2,4,5-T and 2,4-D use was considerably higher in one division, the council reported no differences in the rates or types of defects.

NURSERY

Mich. scientists make plant cloning possible

A technique forming the basis to produce hybrid plants with reduced flowering time, like the kalancho, thereby cutting down on energy and labor costs to keep the plant under short-day conditions, has been developed in the laboratory of Dr. Kenneth Sink, Jr., Michigan State University Professor of Horticulture, according to an article in the Voice of M.A.N., the Michigan Association of Nurserymen's publication.

The adventitious bud technique, a type of single cell tissue culture, involves taking a slice from the leaf petiole of a plant, placing it in a culture medium, then exposing it to the right combination of light and temperature to promote shoot growth.

New plant varieties can be produced by treating the cell cultures with radiation or mutation-inducing chemicals that change the genetic code contained in the cells.

Sink has found 8 to 10 species, including petunias tobacco and potatoes, that the system will work on. Two Michigan nurserymen, Walter's Gardens in Zeeland, and Goldner-Walsh in Howell, are using tissue culture according to the article.

TURF

Greenbug effect to be studied in Ohio

Stepped up efforts are planned for 1979 to learn more about *Schizaphis graminum* (Rodani), the greenbug aphid that has been causing increased levels of damage to turfgrasses.

Drs. Harry Niemczyk, Professor of Turfgrass Entomology, and L.R. Nault, aphid specialist, at the Ohio Agricultural Research and Development Center, will be co-investigators in the study.

The goal of the study is to learn more about the greenbug and to develop effective and economical methods of controlling damage. Information on the insecticides tested in the study could lead to the granting of a state or national label for the use of materials not presently registered for greenbug control. Funds to support the project are invited from the turfgrass industry.

Various biotypes of the greenbug have developed which attach specific grass hosts. Speculation is that a new bluegrass adapted biotype of the greenbug has evolved in Ohio and other midwestern and eastern states.

The greenbug damages grasses in several ways. With piercing-sucking mouthparts it feeds on phloem sap. Large numbers of the insects seriously weaken plants. In addition, the greenbug secretes a salivary phytotoxin which is injected into the plant, resulting in yellow and orange spots on the leaves. There is the possibility that the toxin may also move within the plant and weaken the root system. The aphid may also be involved in the transmission of virus diseases.

Greenbug damage first appears in late June and continues through September. (See *WEEDS TREES & TURF*, October, 1978). Some control has been achieved with organophosphates, but three or four follow-up applications may be needed.

The new research effort will attempt to establish whether or not a bluegrass-specific greenbug has developed and if so, does it overwinter in bluegrass and will management practices affect overall populations.

Varieties of bluegrass will be screened for resistance or tolerance.

SALT

Microscope shows cell damage to pines

Salt damage to trees and shrubs is being evaluated with a scanning electron microscope by Drs. Charles Krause and Alden Townsend, at the U.S. Department of Agriculture's Nursery Crops Research Laboratory.

Krause said they evaluated bristlecone pine and Japanese white pine after they were sprayed twice a day for 10 days with a two percent salt spray. The unaided eye could detect brown needles and typical salt damage symptoms on the bristlecone pine but the Japanese white pine appeared healthy and vigorous.

When examined under the electron microscope, however, the Japanese pine showed damage to the surface guard cells on the needles and

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Landscape Contractor News

Soil erosion lab to be built

Construction of a $3.6 million National Soil Erosion Laboratory on the Purdue University Campus in West Lafayette, Indiana, should be underway by next summer, according to a USDA spokesman.

Earl R. Glover, acting regional administrator for agricultural research of the department's Science and Education Administration said the laboratory should be ready for occupancy by late 1980 or early 1981. Construction funds were included in the agricultural appropriations bill approved by Congress and signed by the President in October.

The two-story building will provide space for about 15 Science and Education Administration agricultural research scientists and 22 support staff. Plans for the building are now in the prelimiary design stage.

"There will also be space for cooperating Purdue research and teaching staff as well as graduate students and visitings scientists," Glover said.

"We will give special attention to erosion problems on disturbed lands, such as strip mine and construction sites," he added.

St. Louis honored as Green Survival City

The American Association of Nurserymen has announced the official designation of St. Louis, Mo., as a Green Survival City. "The City of Trees" received its certificate from AAN President Ernest Tosovsky and Vice President Hugh Steavenson during special ceremonies in November at a joint meeting of the St. Louis Landscape and Nursery Association and the St. Louis Arborist Association.

Landscape beautification and planting activities have always played an important role in the city. During St. Louis' bicentennial celebration in 1964, the St. Louis Landscape & Nursery Association conducted a planting program whereby citizens could donate funds to sponsor tree planting. In one year $64,000 was raised.

The city's most recognized and successful planting program was initiated in 1971. Called "Project Greenback," this public awareness project is operated jointly by the St. Louis Landscape & Nursery Association, the St. Louis Arborist Association, the Residential Betterment Section of the St. Louis Community Development Agency, and the Forestry Division of the Department of Parks, Recreation and Forestry.

TURF

Ohio simulator to provide turf data

Ohio agronomists have built an environmental simulator with which to study northern, cool season turfgrasses in the laboratory. Bruce J. Augustin, a graduate student in agronomy at The Ohio State University, has spent the better part of a year assembling the unit under the guidance of Keith J. Karnok, turfgrass specialist for the Ohio Agricultural Research and Development Center.

Composed of two growth chambers, adjustable sun lamps, air pumps, connecting hoses, sampling tubes, and various monitoring and recording devices, the facility has the capability of simulating a variety of environmental conditions. Augustin can control light intensity and quality, daylength, relative humidity, wind velocity, air and soil temperatures, and soil moisture in numerous combinations.

Augustin said that with the simulator he can study all the aspects (what goes on above and below the ground) important to healthy turf at one time without actually disturbing the grass.

other symptoms though not as serious as those of the bristlecone pine.

Tiny salt crystals were also visible under the microscope which produces a three dimensional image of a specimen on a television screen magnified up to 200,000 times.

Krause said that the electron microscope permits the scientists to detect subtle differences between salt-tolerant and salt-susceptible plant species.

TURF

Penncross bent rated superior in NGF survey

A recent nationwide survey conducted by the National Golf Foundation showed 60% of the respondents rating Penncross bentgrass superior as a putting surface. Results were received from 1,623 golf facilities, representing a cross-section by type, size of course and geographic location.

Other results revealed that bluegrass was the most frequently used species on tees (32%), fairways (52%) and roughs (53%). Bentgrass had the second highest frequency of use on tees (26%), bermuda was second on fairways (23%) and roughs (19%). On greens, bentgrass was most often used (79%) followed by bermuda (15%). Climate was given as the leading factor in influencing selection of grasses.

Sixty percent of the respondents reported annual budgets for grass seed of $1000 and under. The median figure was $833, while the average was $1485. The average per pound for overseeding bentgrass was $5.19.

Expanded green renovation for next year was planned by 27 percent of the facilities.

PARKS

PGMS elects new officers

Fred A. Lennertz, Jr., has been reelected to his second term as president of the Professional Grounds Maintenance Soceity. J. Alton Enloe is the vice president. He has served on the Board of Directors and was co-chairman of the 1977 Annual Conference in Houston. John R. Van Vorst was re-elected treasurer. vorst was a 1978 recipient of an award in the Grounds Maintenance Award Program. He is Superviosr of Parks for the Borough of Tenafly in New Jersey.

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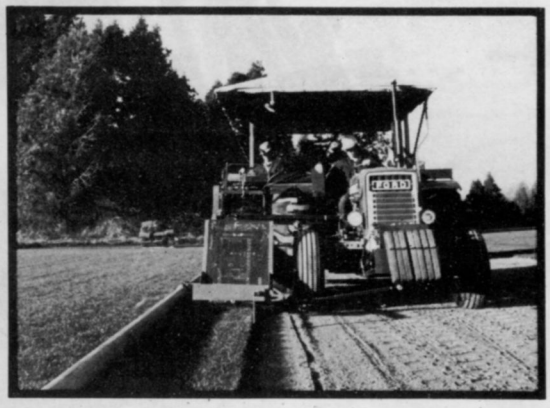

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IRRIGATION RENOVATION DECISIONS AND MAINTAINING SYSTEM EFFICIENCY

Auger replaces soil where vibratory plow began pipe and wire pulling.

Efficiency of sprinkler irrigation systems is an increasingly popular topic on turf meeting agendas, primarily because the cost of water has begun to climb significantly and progress has been made in irrigation system design.

An irrigation system is usually a valuable asset on the books of a park system, golf course, memorial park, or corporation with landscaped grounds. Like any asset, it should be protected through regular maintenance.

Plastic (polyvinyl chloride and polyethylene) pipes have reduced the amount of pipe maintenance necessary since their introduction in the 1950's. A variety of materials was used before and still is to an extent today. They include galvanized steel, copper, cast iron, and asbestos cement. Each has weaknesses which reduce its desirability for use in irrigation.

For example, rust and scale deposits in cast iron and steel pipe can reduce carrying capacity by 50 percent in 15 to 20 years. Reduction in carrying capacity results in reduced coverage of the system. How many quick coupler systems using iron and steel pipe and more than 20-years-old are in use today? Fairly many.

Plastic and copper pipe can be pulled into the ground by vibratory plows minimizing surface disturbance and reducing installation time.

Protective devises such as flexible risers, anti-hammer controls and water/solids separators, have reduced the amount of mechanical damage to heads and lines. Security locks have made pilferage of heads more difficult as well.

Controllers are now available in solid state as well as electromechanical versions. Solid state controllers have fewer moving parts and thus increased reliability and reduced size. They can be custom programmed for any user.

A previously developed but recently perfected type of control system called modulating pressure control (MPC) will be offered this year by Toro's irrigation division. This system does away with wiring between controllers and heads. Instead, pressure impulses in the water lines tell small controls (cyclers) at each head or zone when to open and for how long. This system was designed specifically for renovating older, small quick coupler systems.

Concern over water use has caused the rise of soil moisture monitors which shut off an irrigation system when the necessary amount of water has been used or when rain makes irrigation unnecessary.

These are just a few of the advances in irrigation technology in the past two decades. They should be considered when reduced efficiency of an older system is discovered. If reduced efficiency is suspected, an irrigation engineer should be consulted. For the name of an irrigation expert in your area contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, Maryland 20906, (301) 871-8188.

The National Golf Foundation, the United States Golf Association Green Section, and the American Society of Golf Course Arthitects have been studying use of wastewater for irrigation. Partially treated wastewater may be a major source of cheap irrigation water in the future.

Each year the University of California sponsors a Turfgrass Sprinkler Irrigation Conference at Lake Arrowhead, California. Since many of the manufacturers of irrigation components are in that state, the conference is a major one and provides a good cross-section of developments in irrigation each year.

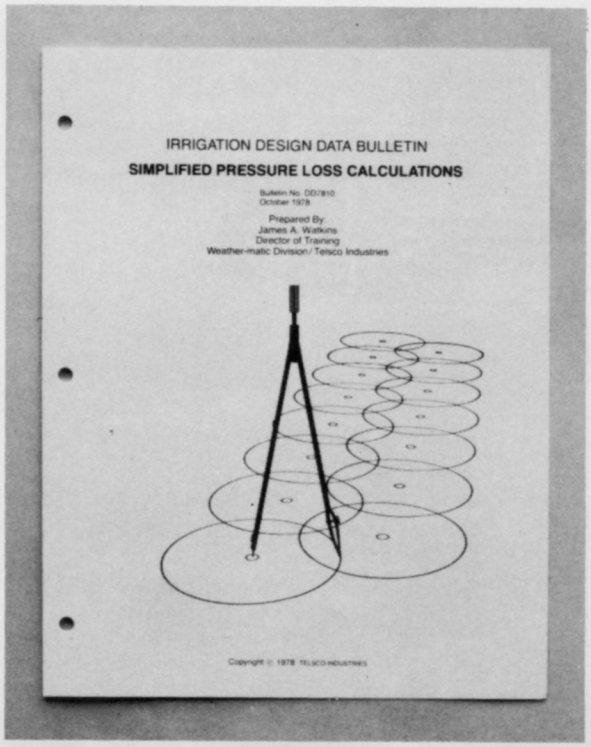
Judging the need for renovation

Irrigation systems are more complex than they would seem. Even a simple residential system with six heads may have three different types of heads to provide the desired dispersal of water to turf and shrubs. However, there is some basic information which may help in judging an older system's performance. And there are solutions to these problems based upon current technology.

Piping

Pipe is the largest limiting factor in an irrigation system. The size of mains and laterals limits the rate and amount of water available for each section of irrigated area. Selection of heads is based

Pulling pipe and wires into ground causes minimal surface disturbance (above). Pipe is attached to vibratory plow blade with pulling grip (below).


IRRIGATION DESIGN DATA BULLETIN

SIMPLIFIED PRESSURE LOSS CALCULATIONS

Bulletin No. DD7810
October 1978

Prepared By
James A. Watkins
Director of Training
Weather-matic Division/Telsco Industries

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Simplified pressure loss calculations are explained in a technical pamphlet by James A. Watkins, director of training for the Weathermatic Div. of Telsco Industries, P.O. Box 18205, Dallas, TX 75218.

upon the amount and rate of water supplied to it by the pipes in order to cover an intended amount of turf.

Flow capacity of pipes can be reduced by friction of the inner pipe surface, accumulation of deposits inside the pipe, and the amount of pressure the pipe can withstand. These characteristics should be considered for each type of pipe.

Until the 1950's, metal piping was used for turf irrigation systems. Galvanized steel, cast iron and copper were all common.

As mentioned earlier, cast iron and steel pipes can have their carrying capacity halved in less than 20 years because of corrosion and mineral deposits inside the pipe. This problem is solved by use of plastic or asbestos-cement pipes.

External corrosion of metal pipes is also a problem. In the case of copper, the solder joints are an additional problem. Any metal pipe laid in acid soil or gravel will undergo corrosion. Designers discourage laying metal pipes in cinders for this reason. Electrolytic corrosion is also a problem when copper pipe is connected to iron or steel pipes without dielectric couplers.

Copper pipe is still recommended by some designers for shrub heads because of its flexibility.

Cast iron, asbestos-cement, and plastic pipe tend to be more brittle than other types. Care must be taken during installation to provide support along the entire length of pipe. Asbestos-cement pipe requires special concrete blocks at all turns to guard against breakage by water hammer.

There are two types of plastic pipe, polyvinyl chloride and polyethylene. Plastic pipes can creep or stretch when overpressurized. Creep is caused when temporary high pressure causes the pipe to expand and the pipe does not return to its original size. If this occurs frequently the pipe will eventually break.

Polyethylene pipe creeps more than PVC and consequently should be used in low pressure systems only. Pressure must be watched for PVC pipe as well. There are grades of PVC pipe based on pressure. The right grade is needed for the right pressure designed for the system.

Care must be taken in installing plastic pipe to make sure the pipe is not grooved or scraped. James A. Watkins, author of "The Turf Irrigation Manual" says pulling pipe into rocky soil may damage the pipe. A sand base and backfill may be required in some soils. Grooving plastic pipe can reduce its strength.

There are other considerations necessary for pipe selection. Inner diameter, friction, and flow capacity are some of them. These involve mathematical calculations which are best done by experts.

Controllers

A controller is a devise which implements preselected commands for time and location of irrigation. A controller is limited by the number of stations it can regulate. If expansion is likely, a controller should have extra station controls to handle it.

The controller carries out it commands either by signalling main and zone valves through wires or by pressure impulses read by cyclers at the heads.

The electrical methods are electromechanical and solid state. The electromechanical systems utilize a mechanical clock and switches to send the correct signal to valves. The solid state system utilizes computer technology to achieve the same results. Call it a digital watch with microcircuits doing the work. Both systems require a buried set of wires to each zone or station. Solid state offers

Proper way to install a flexible riser to a sprinkler head. Flexible risers reduce mechanical damage to pipes underground.

some additional flexibility in control choices and fewer field controllers according to Johns-Manville.

However, Erich Wittig of the Toro Co., said at the Ohio Turf Foundation Conference this December that solid state systems have their weaknesses too. He said programming mistakes or damage to a chip can cause delays in some instances. In other words, don't give up on a good electromechanical system if it is working properly.

The new modulating pressure control (MPC) system, soon available from Toro, eliminates the need for a network of wires across a turf area. It was designed for smaller manual irrigation systems that now use quick-coupler heads. Commands are sent to cyclers (small controllers) at each head or zone as changes in pressure in the water lines. A disadvantage is that commands are sent in sequence. So, if you want to tell the tenth station to activate, you have to go through commands for one through nine first.

The MPC system can reduce costs if a large amount of flexibility isn't needed. If the system proves popular further development may increase flexibility.

Heads, Pumps and Pressure

Achieving the desired coverage involves a series of relationships with pressure, heads, pipe capability, and design. Making all these pieces fit together is the job of the irrigation expert and is best left to him.

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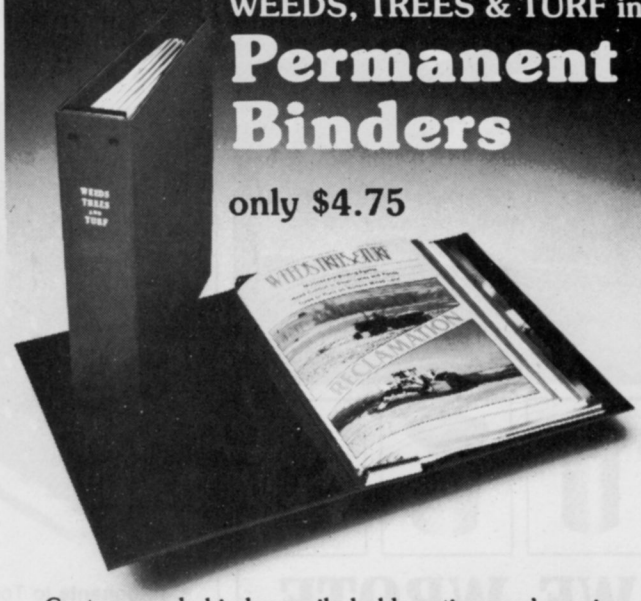

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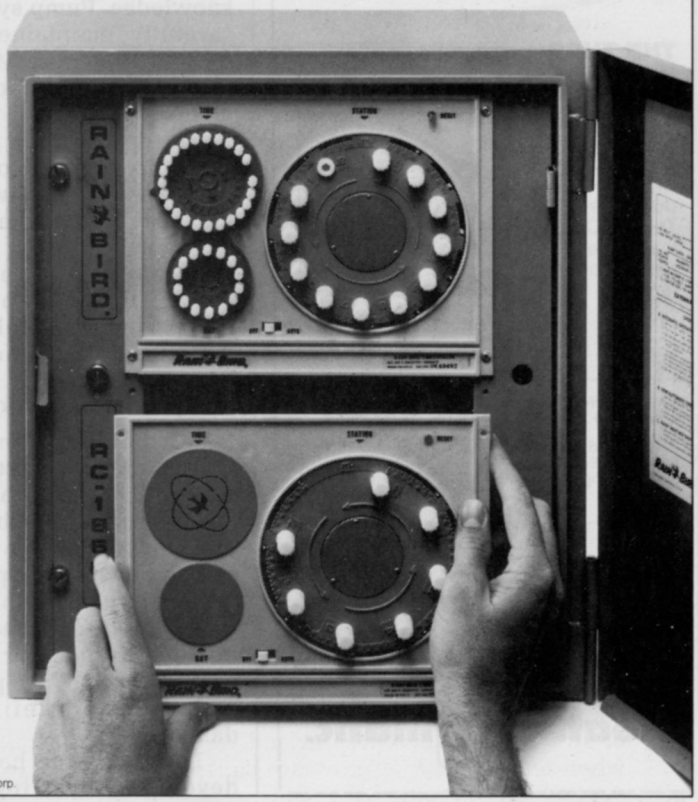

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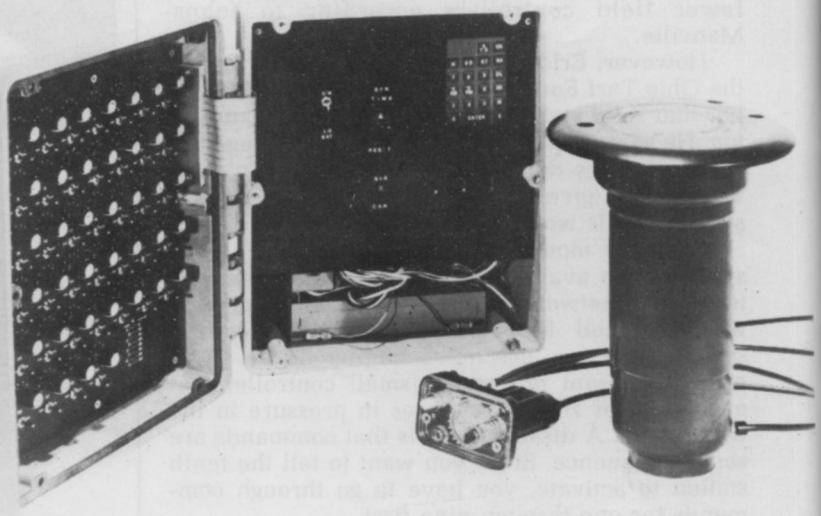

Components to Toro's modulating pressure control system; left to right, central controller, cycler, and valve-in-head gear-driven rotary head to replace the quick coupler.

Each part must function to specifications after installation to maintain system efficiency.

Closely designed systems depend upon a consistent pressure level. Systems using city water should be designed for the lowest city pressure with the inclusion of pressure regulators to guard against surges.

Where water comes from natural sources, a sophisticated pump system is needed. Again, the complexity of the device requires expert knowledge. Pump systems should be carefully maintained and checked for performance. MPC systems especially depend upon pump performance.

Heads, whether rotary, spray or other, are selected to provide certain coverage with a given pressure. If they malfunction they may throw off coverage of other heads due to redistribution of pressure in the lines. Damaged heads must be replaced immediately with heads of the same specification.

Protective and security devices

Mechanical damage and vandalism can be costly. If a heavy mower damages a head and breaks the pipe underneath, major repairs are needed. Flexible hoses can be installed between the pipe and head to prevent this. Also, some manufacturers offer heads that retract into the ground after use. How heads are connected to pipes can also reduce the likelihood of pipe damage.

Lock nuts for heads have been developed by King Brothers Industries in Valencia, California. These make removal of heads difficult for vandals.

Another device helpful in protecting irrigation efficiency is a separator. It is a system designed to cause solids, primarily sand, to drop out of water before it enters the pipes. One company making separators is Laval Separator Corp. in Fresno, California. For the separators to be effective, pressure of water entering the separator must be maintained at a high enough level.

A great deal goes into an automatic irrigation system. To keep it functioning efficiently to reduce water use and obtain good turf results requires constant maintenance. **WTT**

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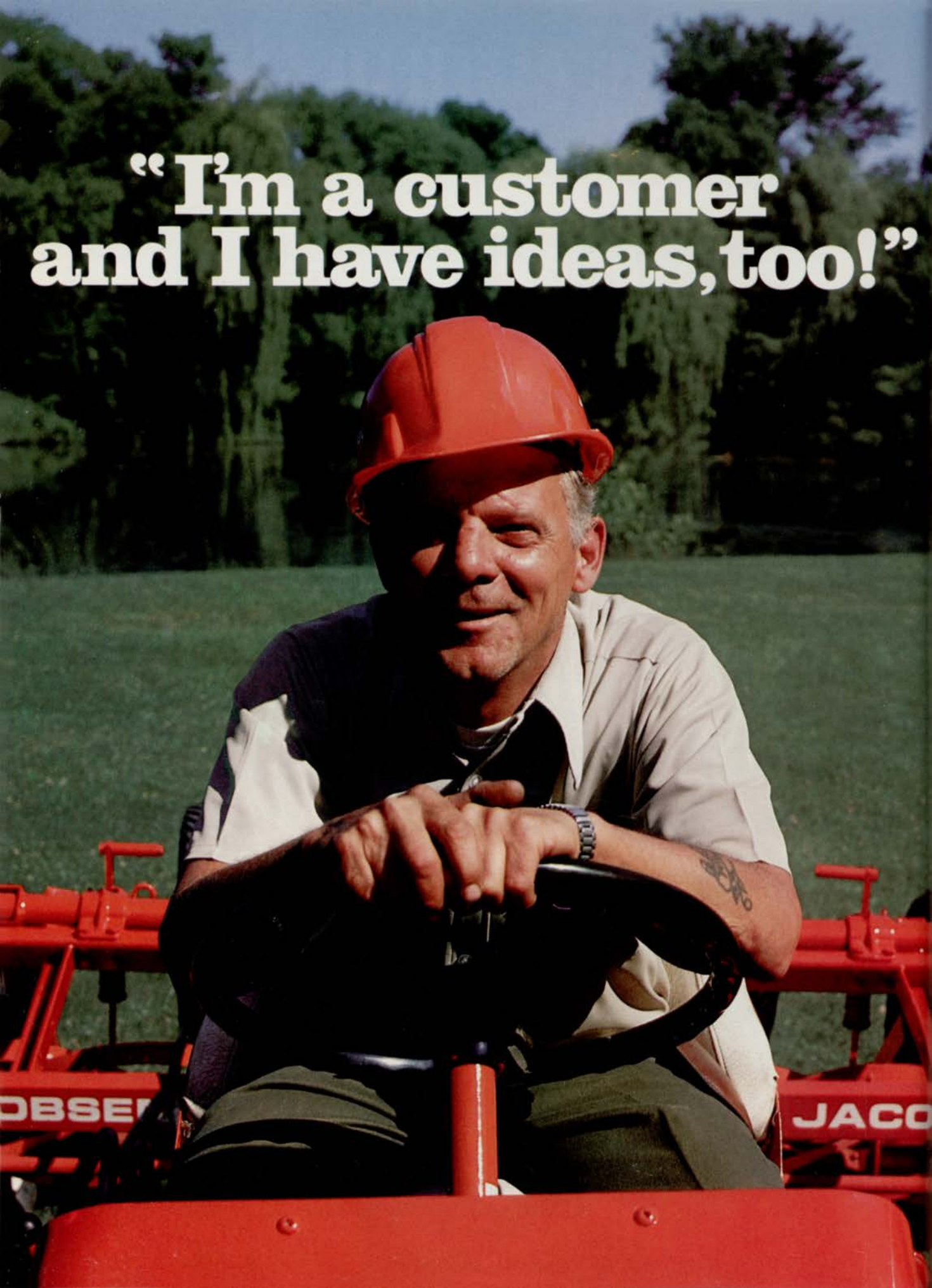
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HOW TO APPRAISE TREES AND PLANTS FOR TAX AND INSURANCE PURPOSES

This article has been derived from a soon-to-be-released audio visual program by the Council of Tree and Landscape Appraisers. The Council is a cooperative venture by five major professional organizations to promote the importance of the landscape contractor, arborist, and nurseryman in establishing plant values for tax and insurance causes. The five organizations are The American Society of Consulting Arborists, the International Society of Arboriculture, the Associated Landscape Contractors of America, the National Arborist Association, and the American Association of Nurserymen. Special thanks goes to F. R. Micha, a member of the Council for his help in preparing this article.

The book mentioned in the article, "The Guide for Establishing Tree and Plant Values" will be released in February by the International Society of Arboriculture. The audio/visual program, designed actually for homeowners and insurance agents, will be available in late January. All inquiries should go to the Council (address at end of article).

Shade trees and other landscape plants have traditionally been considered important for their aesthetic qualities. They also play important roles in air purification, temperature control, noise abatement, control of wind and erosion, and privacy.

Considering these various benefits of plants in a landscape, the need to assign a financial value becomes obvious.

How this value is determined and what it means to a property owner in tax and insurance matters are just two reasons why plant appraisal is best performed by skilled professionals.

The U.S. Forest Service reports that trees can add as much as 20 percent to the value of property. Real estate studies show that smart landscaping can add up to 30 percent to the sale price. When a tree or landscape plant is damaged or destroyed, the value of property is reduced.

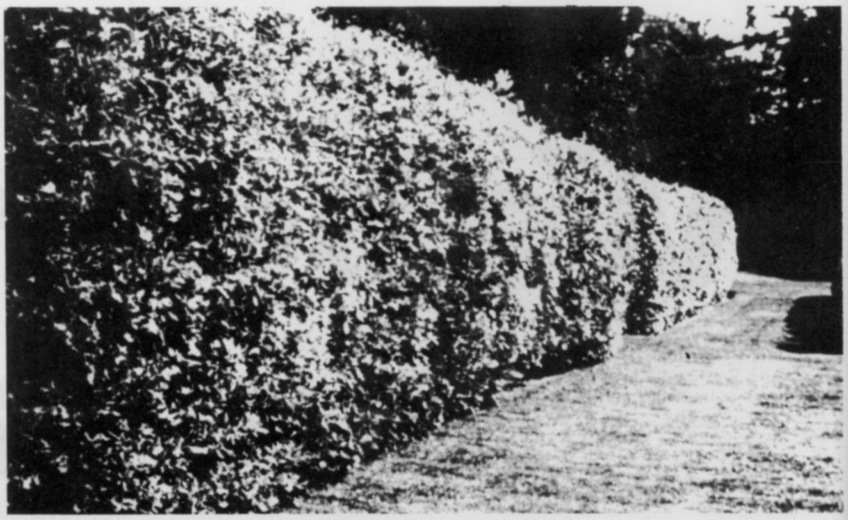
If the damaged plant is small enough to be replaced readily, the professional has little difficulty establishing a realistic value because he is familiar with replacement costs.

Trees up to 12 inches in diameter and most shrubs and evergreens are in this "transplantable" category.

The Internal Revenue Service will usually accept replacement costs as a tax loss. Treasury regulations provide that normally the casualty loss should be measured by "competent appraisal." They also provide that the "cost of repair" is acceptable as evidence of the loss with the conditions that the repairs were necessary, reasonable in amount, don't go beyond the damage incurred, and don't raise the property value above its pre-casualty level.

Trees larger than 12 inches in diameter present a significantly more complex set of determinations. These criteria are published in a book, "The Guide to Establishing Tree and Plant Values," by the International Society of Arboriculture.

Row of hedges provides privacy. A mature hedge like the one pictured would take years to replace in the case of damage.



Basically, the value of trees ranging from 13 to 40 inches in trunk diameter is determined by multiplying the area (in square inches) of a cross section of the trunk at a height of four-and-a-half feet by $15.

Once this figure is obtained, three other factors must be considered. They are the kind of plant, condition and location. Each of these are judged on a percentage basis (100 percent being highest) and multiplied by the cross section value.

It is the job of assigning a percentage value for type, condition, and location that most requires the knowledge of a professional plant appraiser.

Recently during a workshop on establishing tree values sponsored by the American Society of Consulting Arborists at the National Arboretum in Washington, D.C., 100 tree and landscape plant specialists judged a selected variety of plants for value and damage incurred.

One of the trees judged had been damaged, probably beyond repair by a fire resulting from a workman's accident. A value for the oak was needed to file a damage claim.

The oak measured 32 inches in diameter at four-and-a-half feet above the ground. The area of the cross section is approximately 800 sq. in. (pi x radius^2 or 3.14 x 16^2). Multiplying 800 by $15, a value of $12,000 is obtained.

The Guide contains tables which list area and value for many sizes of plants.

Next to consider is the type of tree. Oaks are hardy trees, fairly insect and disease resistant, with important environmental contributions. They are therefore rated high on a percentage scale. The 100 professionals assigned a 90 percent value. The value is accordingly reduced, $12,000 x 90 percent, or $10,800.

The location of the tree was good as an integral part of a landscape. The appraisers assigned a 90 percent value for location. Therefore, the value was again reduced, $10,800 x 90 percent, or $9,720.

Fred Micha (right), member of The Council of Tree and Landscape Appraisers, chats with fellow arborists L. Martin (left) and A. Sandstrom (center).

Finally, the condition of the tree was judged. The condition of the tree before the fire was difficult to judge since no photographs of the tree before damage existed. The appraisers had to consider the age of the tree, its life expectancy under normal conditions, buds emerging in spite of the damage, and branches not touched by the fire. All these factors led the appraisers to rate the pre-accident condition at 60 percent. The final reduction ($9,720 x 60 percent) results in a precasualty value of $5,832. This is the amount that should be listed in the insurance claim.

A second tree appraised by the group was a Korean pine, an evergreen. Rather than measure the diameter, the professional bases the beginning of his formula on the height of the tree.

The Guide includes a table of basic values for evergreen trees and shrubs at various heights.

Estate pictured could suffer tremendous losses in the case of a severe ice storm. The owner would be wise to have plants appraised periodically to guard against low appraisal in case of damage.

Condition guide for shade trees

Once a nontransplantable plant is damaged, its precasualty condition is the hardest factor to judge. Only on rare occasions is there a photo or appraisal on hand to document precasualty value.

Like jewelry or anything else of value, an owner should keep updated records on value. Homeowners and other property owners should periodically have valuable plants appraised by a professional plant appraiser. An appraiser can estimate precasualty condition after a loss based upon evidence, but the most accurate figure comes from periodic appraisal before damage takes place.

Bruce L. Webster, urban forester for the Nebraska Forest Service in Lincoln, has reported a point system for the condition of shade trees. This system was published in the Nov. 1978 issue of the Journal of Arboriculture.

It is a formula utilizing five factors; trunk, growth rate, structure, insects and diseases, crown development, and life expectancy. Each factor is assigned a point value and these are added together for an overall condition rating.

Guide for judging the condition of a shade tree.

A. Trunk condition

Sound & Solid	Sections of bark missing	extensive decay & hollow
5	3	1

B. Growth rate (consider species)

more than 6" twig elongation	2-6" twig elongation	less than 2" twig elongation
3	2	1

C. Structure

Sound	one major/several minor limbs dead, broken, missing	2 or more major limbs broken, dead, missing
5	3	1

D. Insect & disease

No pests present	1 pest present	2 or more pests present
3	2	1

E. Crown development

Full & Balanced	full but unbalanced	unbalanced & lacking a full crown
5	3	1

F. Life expectancy

over 30 years	15-20 years	less than 5 years
5	3	1

Condition Class:	Percent	Rating
Excellent:	80-100%	26-23
Good:	60-80%	22-19
Fair:	40-60%	18-14
Poor:	20-40%	13-10
Very Poor:	0-20%	9-6

The percent figure (center column above) can be used for the condition percentage in the standard appraisal equation for nontransplantable trees.

A Korean pine is practically irreplaceable since there are only a few in this country. Arriving at a real dollar value for a rare tree, especially if no precedent exists for assigning a value, is very difficult.

The tree was in a prominent place and helped screen the view of a parking lot behind it. However, it was planted too near an oak tree which was crowding the pine. A location value of 70 percent was selected.

There is another kind of challenge in appraising plants, multi-stemmed trees such as Crepe Myrtle. There are three ways to calculate values for multi-stemmed plants.

One is to determine replacement costs, if it is transplantable. Another is to base the appraisal on the value of a single-stem tree that would give the same tree canopy. The third is more complex.

In the third method, the value is based upon the diameter measurement of the largest stem, plus 50 to 70 percent of the combined diameters of the remaining stems. After arriving at this figure, standard reductions for type, location and condition are made.

Crepe Myrtle is subject to winter damage. Because of this, its type rating is lower than some plants. In determining a precasualty value for a Crepe Myrtle, the severity of previous winters would have to be considered.

Such plant characteristics are just part of the knowledge an appraiser must have to make an accurate value determination. Only trained and experienced professionals know all the factors that must be considered in plant appraisal.

The five member associations of the Council of Tree and Landscape Appraisal are the correct source for individuals with the proper training in plant characteristics and appraisal.

Addresses

Council of Tree and Landscape Appraisers
Attn: Paul Dawson
232 Southern Bldg.
Washington, D.C. 20005
(202) 347-8219

American Association of Nurserymen
230 Southern Bldg.
Washington, D.C. 20005
(202) 737-4060

National Arborist Association
3537 Stratford Rd.
Wantagh, NY 11793
(516) 221-3082

International Society of Arboriculture
E. C. Bundy
P.O. Box 71
Urbana, IL 61801
(217) 328-2032

American Society of Consulting Arborists
12 Lakeview Ave.
Miltown, NJ 08850
(201) 821-8948

Associated Landscape Contractors of America
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PARK MAINTENANCE PLANNING BEGINS WITH GOOD DESIGN

By Theodore J. Haskell, Professor
Department of Park and Recreation Resources
Michigan State University
East Lansing, Michigan

Heavily used picnic area (above). Note compaction and loss of ground cover and small trees. Stationary tables (below) and concrete pad make high use area easier to maintain and less damaging to nearby vegetation.

Whether we need a park bench or a park system, we must design for maintenance and then, maintain the design. Far too often new park and recreation areas are developed without adequate understanding of future maintenance costs, and often the potential of a good design is not realized because of lack of appreciation and enthusiasm in the maintenance crews.

Design and maintenance are both tools used to meet the needs of the public. These tools are so closely related that each is only marginally effective without the other.

The key to effective use of these tools is human use. Human use justifies designs and determines the level of maintenance. At the "wilderness" end of the management yardstick we may have an area like Isle Royale National Park. There is a little civilization at boat landings and miles of ecologically balanced forest trees, moose, wolves and beavers in between. This sort of facility has a very low level of development, relatively few visitors, and simple sorts of maintenance operations. At the other end we find the "formal gardens," at Niagara Falls, Golden Gate Park in San Francisco, or a theme park like Disneyland. These are highly developed, serve many visitors, and utilize a complicated system of maintenance planning that has virtually every blade of grass under the eye of a trained gardner. All the other recreation and leisure facilities will fall somewhere in between.

As the human use increases we must increase the level of maintenance or "human erosion" will destroy the very qualities that gave it value in the beginning.

Park operators today are trying to achieve two goals:

1. Provide a safe and satisfying recreational experience, and
2. Protect the resource.

While these may seem almost contradictory, we can achieve substantial progress through consideration of two questions: the design question, "how do we predict use?", and the maintenance question, "what does use imply?"

The design question

How do we predict use? The answer always starts with some concept of need, some general statement of policy or set of standards, and then becomes a more specific application as we apply it to concrete situations.

Harold Horowitz, an architect, defines a successful design as "one that translates the needs of the user, as expressed in the program, into a significant physical form."

Dan Kiley, landscape architect, warns that we tend to design in only two dimensions, without concern for the human values of the people who must use the area. C. M. Deasey stresses that design goals should improve personal relationships and ease strain. He suggests that the design of an area

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Path from community center to tennis courts is free flowing but direct and hard surfaced to take wear. Note play equipment island with sand. Park is located in Fort Mill, South Carolina.

should (1) maintain the value of the product, (2) maintain control, (3) function efficiently, that is, allow everyone to adapt their individual goals to those of the group.

Our designs must function. They must do what they are supposed to do. We must design for use and for the maintenance that use implies. For example, there must be paths where many people will wish to walk and these paths must be kept clear of litter, mud, ice and snow, fallen tree limbs, **and** there must be access for maintenance crews and equipment to get in and out in an efficient and economical manner.

How well do our current designs measure up? Not too well in many cases. Some cities have newly constructed facilities that are beautiful, creative, and imaginative; facilities that win awards for the designers, and give the maintenance men grey hair and ulcers.

We find that expensive hand maintenance is often the only answer. Usually the problems of steps, narrow openings, high maintenance plant materials, exposed plumbing and lighting fixtures, and wall surfaces that invite graffiti, do not **individually** create much delay or extra maintenance work, but the **collective** time required each year, year after year, can be frightening to an administrator trying to stretch a budget in inflationary times.

When we plan a building or outdoor facility we tend to think of the initial costs, often making the decision to use a cheaper material to reduce the initial investment. However, a Pennsylvania planner estimated the initial construction costs of a facility may represent only 5% or 10% of the funds spent over the life of the facility to operate and maintain it.

"People-use" is the desired result. If we don't trim, paint, light, heat, cool, oil, clean, and so on the people won't use the facility. Poor maintenance is a powerful dissatisfier.

At the other extreme we have designs that are little more than "rubber-stamp" solutions. Monuments to yesterday's successful designs. Minimum budget answers that offer a cafeteria of facilities instead of getting community input.

Impact of Change And Growth

Even if a park design does fit the precise needs of its community when it is first developed, we must allow for growth and change of the community around it. Designers should remember the advice of a famous planner who said, "It is better to be approximately right than exactly wrong, since the future will never develop precisely as we expect."

A park design must be defensible in the face of change or capable of modification. The extent to which a park will be defended, kept stable or modified through redesign, will be a policy decision, but the designers and maintenance planners must be aware of the implications for design as the use-patterns change over time.

One of the most common of these changes is crowding. As more and more people wish to use the park the relationships between "community" (being with others) and "privacy" (being alone) change. Researchers and other thoughtful people

are concerned with a thing called "carrying capacity". That is, how many people can use a picnic area, beach, nature trail, canoe, water-ski, etc., before the activity is spoiled?

There are some who say "No problem." When it's too crowded for family A they'll leave. But the B's will come and probably the C's after them. Each group in turn establishes a higher norm.

Perhaps it can work this way for people but one of our most critical problems is the subtle but often devastating effect of crowds on the vegetation of outdoor areas.

The sequence of uncontrolled and intensifying use goes like this: (1) compaction begins to change the soil. This is worse on heavier clay soils. (2) The small plants that make up the erosion-fighting groundcover go, (3) shrubs and reproduction trees go, (4) older trees "stag-head" (tops die back and die, (5) finally, the area becomes so shabby that it is either abandoned or partially restored at great expense. Popular wooded picnic areas are particularly vulnerable to this.

Planning for Protection

Planning for protection, of both the people and the natural resource, must start with the designers, but they must communicate the intent of the plans to the experienced maintenance people and put their feed-back into the system.

In critiquing designs we must try to visualize the crowds of people coming to use our facility and say to ourselves, "What else will they want to do?" As we identify and list each element of undesirable use we modify the plans in two ways. First, make adverse use so inconvenient, using barriers, thorny plants etc., that the user's self-interest prevails. Second, be prepared to make some management compromises between what the public might want and a practical use that they might accept.

In one large park visitors were carving name and initials into the huge posts supporting the roof of the main shelter. Realizing that expensive repairs would soon be needed the park officials considered signs and security officers to confiscate knives, but fortunately tried a little creative thinking and realized that the motive of the carvers was not vandalism, but recognition. A set of similar posts were set up in a half circle in the area. They were labeled for regional groupings of states. The carvers, as predicted, switched to the "regional" posts. When a post filled up with initials it was easily replaced with a fresh one.

A National Park Service author wrote suggesting that you place yourself as a park user, doing things they might want to do, yet in a way to minimize damage:

1. Put paths and walks in lines of natural circulation. Some have even suggested it would be good to wait until the second year before putting in permanent walks. Put them in where the paths were worn during the first year.
2. Keep your rest rooms and other service buildings and parking lots related to the principal activity areas of the park.
3. Use low barriers to control traffic.
4. Where possible, use vegetation to replace fences. If proper plant materials are chosen you eliminate the cost of painting fence and add to the attractiveness of the area. If shrubs must be kept low for security, then make the barrier wide and prickly.
5. Fixed tables and stoves will concentrate use and reduce "human erosion" of surrounding vegetation.
6. Limited capacity parking lots tied in with the traffic patterns and good transfer-points will help protect sensitive areas from overloading.

As the designers and maintenance planners do their creative reviewing of park areas, they must remember that protection planning requires not only design skills on the drawing boards, but also psychology and observation of human nature in the field. People will move tables to get out of sun or smoke. People will park in the shade. People will slide down or run down a hill if it looks shorter.

Management is the key word. Park and recreation landscape use implies interaction between people and the resources. From the wilderness to the garden land-managers have a job of developing designs that can be maintained.

There Is a Choice

We can meet the high operating costs of poorly designed facilities or learn to be more critical of original designs.

Costly features in a proposed design include awkwardly shaped areas of turf or paving that require extra maneuvering to mow, fertilize, sweep or snowplow. Designs that do not allow for traffic circulation and easy access to activity areas for service and maintenance vehicles take more time to maintain.

Other time-wasters include poor access to utilities and lack of hook-ups for light and water. Poor design increases costs of snow removal if hand shoveling is required to move or load snow and ice. In fact, any designs that require hand work because power tools and large equipment cannot reach the area should be closely reviewed.

A more practical alternative to hand work is to be more critical of the designs when they are still on paper. Don't let architects preconceive a design until the intended use is clear. Work with them and learn to visualize the people using the facility. In absorbing data in preparation it is important to consider the activity not a structure. Henry Elder said "... to present a problem as "church", "school", or "house" is to accept a problem with a previous solution for minor improvement." Instead, focus on "worship" rather than church, "learning" rather than school, and "living" rather than house." It follows then that we must also consider "play" rather than playground. We must also try to provide ways in which the designers extend their contacts with the project through the construction phases into the actual operation and maintenance.

This overall concern and supervision, including a few trips to see the people using (or misusing) the completed facilities, is much easier when the designers are "in-house" as compared to consultants.

Follow-up inspections take time and consultants must be paid if we expect the service. Too often the important evaluation phase is eliminated

to reduce project costs. This supervisory role is also critical in the choice of materials for the construction.

The design concepts must be translated from blueprints into specifications and finally into materials of many kinds. The control of high maintenance costs may begin with design concepts, but it becomes more critical as materials are chosen. We must decide on the size of trees to plant, whether to seed or sod, what sort of paving for paths, walks, roads, and parking areas, and whether to paint the walls or to use natural materials. Do some designs and materials seem to "attract" vandalism? While a mistake can always be corrected by rebuilding, the subsequent costs are usually higher.

Choice of materials goes beyond varieties of trees and shrubs to include a bewildering range of lumber, tile, concrete and glass. We must make realistic estimates and balance initial costs with projected annual maintenance. We must steer equally between the fragile structure that collapses regularly from over use and must be rebuilt or replaced, and the slick white elephant facility that interests no one but "is so easy to maintain".

It is the use by the people that is the payoff. We must design facilities that can and will be used and then develop them with the most durable and appropriate materials that we can afford.

The maintenance question

What does use imply? When we design a park facility we attempt to predict the ways in which people will want to use it. When we come to maintain it, we are concerned with the ways they actually do use it.

Maintenance is routine recurring work which must be done to keep a park and recreation facility in such a condition that it can be used at its original or designed capacity or capability. When damage occurs, repairs restore the facility to its original capacity. Many agencies also include small additions, changes, expansion and remodeling in this category. In this way small changes in the way people use the areas can be accommodated without complete redesign. It's almost like changing a tire without stopping the car.

Preventive Maintenance

As people begin to use the newly developed area, we must shift more and more toward preventive maintenance. This relates to protection planning in the design process. Both involve study of the user-patterns that develop and planning appropriate modifications as time goes by.

1. *As the use builds up increase the frequency of litter pickup.* If the park is clean in the morning more people use the trash cans. When ethnic festivals, holiday weekends and

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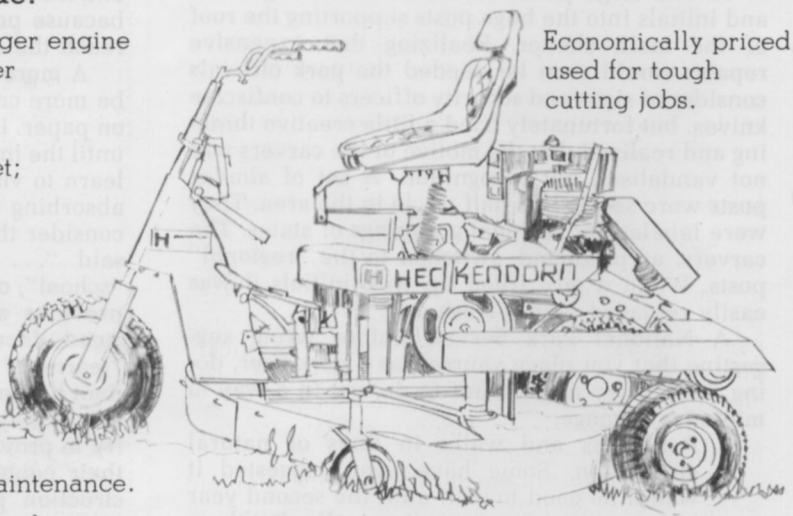

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other heavy litter is forecast many agencies send crews and trucks in at midnight after the first day or early the next morning. Heavy use areas like Disney-World keep trash-collectors, (neatly uniformed and radio-dispatched) on the move among the visitors so that litter never accumulates.

2. *Make repairs quickly.* Add the "three R's" to your maintenance plan: *Repaint* splashes, splatters, and graffiti. Creative comments on our walls invite others to comment. *Repair* minor damage quickly. Hard use results in wear and breakage. Prompt repair protects you from liability and eliminates more damage from vandals. Finally, *Replace* things that break too often. This is where your record keeping pays off and can justify replacing window glass with one of the more expensive, but break-resistant plastics.
3. *As the traffic gets heavier go to harder surfaces:* When the path gets too dusty and/or muddy, add wood chips. When the feet pound the chips to sawdust, put in gravel. If the use still increases or if the elderly or handicapped have problems, go to asphalt (in various colors) or concrete. Each surface requires different consideration for the most efficient maintenance.

Management tools for maintenance

To meet the challenges of this more systematic correlation of design and maintenance a number of management tools are being developed by concerned administrators and tested in park systems across the country.

These management tools adapt procedures developed in business and industry to our problems of balancing park use and protection of the resource. They include:

1. Maintenance standards: What is the desired result?
2. Maintenance plans: Written and graphic application of the standards to specific activity areas.
3. Job schedules, work programs and budgets: Implementing the maintenance plans.

Importance of good supervision

Less obvious than these techniques are the powers of maintenance procedures to affect designs. Good landscape design whether gardens, playing fields, or support areas, may be continued for a long time under good maintenance, or quickly lost without it. The shift from hand labor to the use of skilled workers and specialized machines has brought the art of the landscape manager to a higher level than ever before.

Since the effect of the design is rarely complete when the construction is finished it is essential to have a good supervisor to guide the maintenance for the five or ten years until it can be fully realized. It is vitally important that the man in charge of maintaining the area have the esthetic ability to appreciate the design and the enthusiasm to maintain it.

This point emphasizes the need for care in selecting and developing maintenance supervisors. Try to select people with as much technical and management know-how as you can. Then help them gain an appreciation for the rest of it by encouraging them to talk with people who have the ability and enthusiasm. Designers and maintenance people should meet together, talk together and share their insights. It pays off in park and recreation facilities that do what they are supposed to do and keep on doing it.

In summary, park and recreation facilities are designed to be used in certain ways. Maintaining them implies that they are used. The more they are used, the more maintenance will be needed to keep them functioning in the way that they were designed. Designers should work with maintenance people and maintenance supervisors must develop the ability to appreciate the design and the enthusiasm to maintain it. We must design for maintenance and maintain the design. **WTT**

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AFRICAN SAVANNAH, ASIAN SWAMPS MAKE CALIFORNIA ZOO HOME

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Or consider a job overseeing the rain forest and swamps of southeastern Asia. Heavy rains deluge the area twice each year, in July and January. Land is swampy, a mixture of silt and runoff water from the mountains. Animals live in the trees to avoid the water and move around by "flying."

Much like the preceding missions impossible are tasks performed daily within the more manageable confines of the San Diego Wild Animal Park. The park has compressed northern, southern and eastern Africa and Asia into an 1,800-acre wildlife preserve in the San Pasqual Valley, 30 miles north of San Diego. But that still leaves the park's staff contending with the diverse terrains and environments of southern California, more than 3,000 wild animals and about 3,000 different types of plants.

It was a different story six years ago. When the park opened in May of 1972, verdant hillsides and lush gardens were only a figment of horticulturist Jim Gibbons' imagination.

"My first experience with the Wild Animal Park was a sunny day in January, 1972," Gibbons recalled. "Arriving at the park site early one morning, I looked over vast areas of cut and empty hills and tried to visualize how we would do away with the nakedness. I realized we had quite a job to do, so the entire gardening force dug in and in six years I believe we finally have begun to cover the grounds in verdant growth."

Making a habitat for exotic animals out of vast areas of cut and empty hills has taken six years.

In the early spring of 1972, the horticultural staff began to create a forest. The park's hills and slopes were bulldozed bare and then hydroseeded, a process of applying seeds and slurry with pressure guns. Literally, it was an uphill battle. Bare decomposed granite on the slopes was interspersed with fractured rock outcroppings; the only hopeful signs for plantings were good drainage and porous soil.

An almost constant irrigation program was necessary to germinate the seeds. For the park's water needs, a half-million gallon steel water storage reservoir had been completed in September, 1971, and in the fall of 1972, a water line was completed to the Reed Reservoir, which was incorporated into the City of Escondido water system. Water also is re-used from the sewage treatment plant for irrigation.

When those early plants reached 18 inches high, the park began a vigorous fertilization program that continues today. Every three to four months, with IBDU (Par Ex slow release 25-4-8) fertilizer is applied by helicopter. "We needed a way to cover a large area in a short time," Gibbons said about the aerial fertilization. "It was effective and it wasn't all that expensive." The task of covering up to 400 acres with 10 tons of fertilizer, which would require the work of seven men for two weeks, can be finished in about one hour. A hopper beneath the helicopter is loaded in about three seconds by having a man on the ground ready to pour in the fertilizer. Gibbons said the animals pay the chopper little mind.

The slow release fertilizer releases nitrogen by movement of water in the soil and is not greatly affected by changes in temperature or bacterial action. All materials used by the park's horticultural staff must be approved by a veterinarian for toxicity as well.

As a result of fertilization and other intensive cultural programs, trees have reached heights averaging between 30 and 40 feet with four to six-inch diameters. Exceptional trees are closer to 60 feet with 10 to 12-inch diameters. Eucalyptus and acacia also have grown rapidly in just six years, along with other shrubs, vines, grasses and wild flowers. These products of years of care earned the horticultural staff the Grand Award in its category in a nationwide competition sponsored by the Professional Grounds Maintenance Society in 1976.

In addition to providing beauty, the forest serves as a screen, windbreak and food source for the animals. The eucalyptus is cut and transferred

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3 SPIKERS

The Cushman Quick Spiker attaches to a Turf-Truckster with PTO, hydraulic system and dump kit. You spike a precise 57-inch swath, even over undulating ground, and raise or lower the unit hydraulically. The Trailing Spiker gives you the same width and precise results, but its built-in lifting mechanism is controlled by a pull rope.

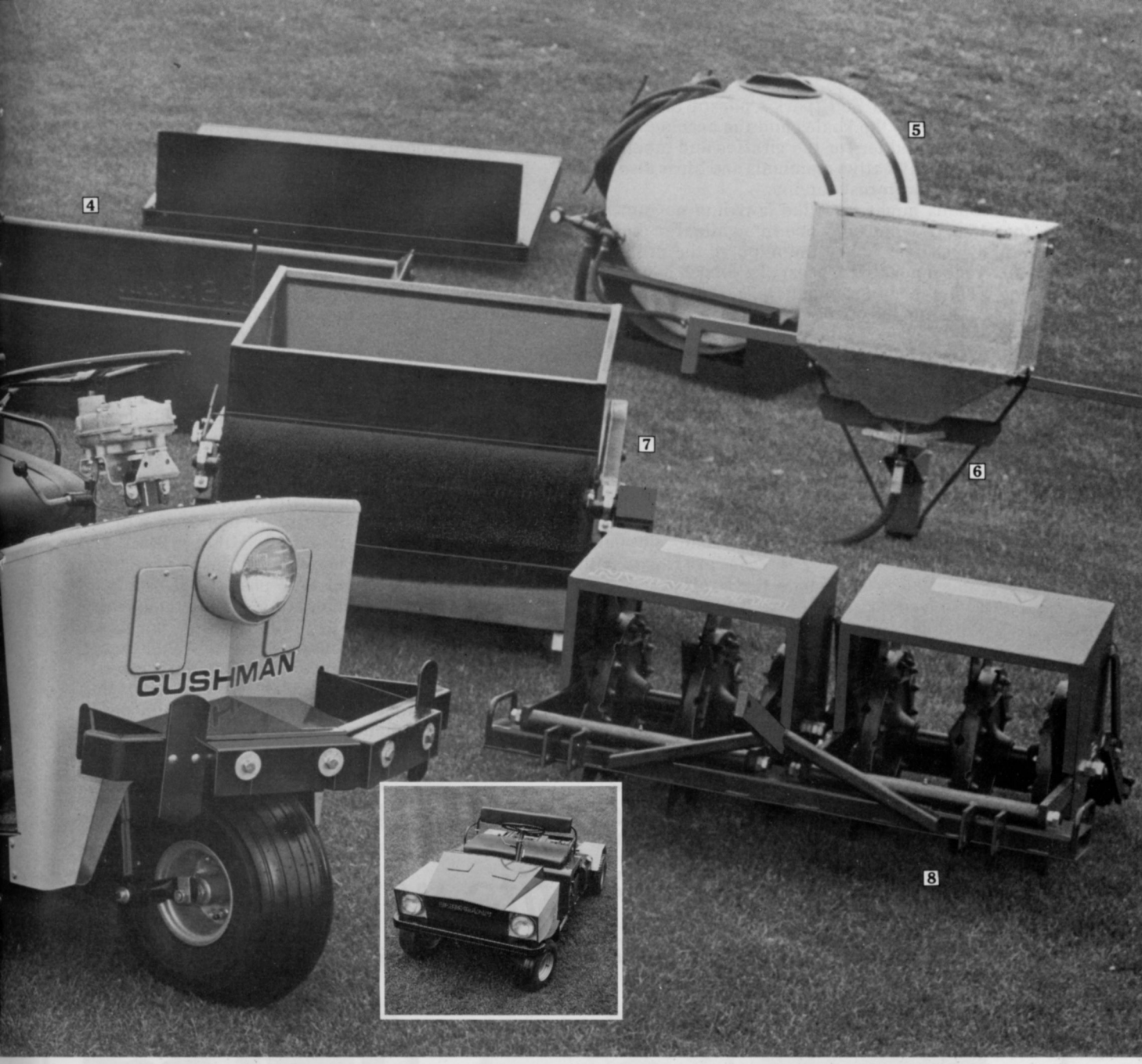
4 SHORT BOX & FLATBED/BOX

These hauling and dumping attachments are mounted quickly with two pull pins. Bolt-on sides and tailgate convert the flatbed to a dump box. Both boxes can be dumped easily with either a manual or powered hydraulic dumping package. And either box is capable of hauling up to 1,000 lb. payloads.*

5 SPRAYER

Use this versatile attachment to spray greens, hard-to-reach roughs, fairways, trees, bushes. The polyethylene tank holds up to 100 gallons of chemical solution. The three-way boom provides an accurate spray for proper application and less chemical waste. The Turf-Truckster transmission and variable speed governor assure uniform ground speed. And the optional handgun lets you "fog" an area or spray up to 40′ in the air.

*Rating for vehicle equipped with 9.50-8 rear tires.



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7 TOP DRESSER
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8 QUICK AERATOR
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to the San Diego Zoo (park's parent facility) for nourishment of the koalas and the acacia provides browse and fodder for the giraffes and other park animals. Many native mammals and birds also find a home in the forest canopy.

Gibbons might feel like crawling up into that forest canopy himself once in awhile, for the past year's successes haven't eliminated the problems. This year the staff's biggest challenges have come not from the environment quirks of Africa and Asia, but from those of Southern California, where this season has been the wettest in nearly 40 years. Those unexpected crises aside, the idiosyncracies of caring for the native homelands of exotic animals remain. The habitats are vast — up to 125 acres; the environments are in a delicate balance. The animals would be the last to realize they weren't actually "at home." The 22-person horticultural staff, in addition to Gibbons, must make sure imported plants from East Africa don't end up in the Asian Highlands, for example. And then there's the problem of giraffes and elephants eating those expensive trees. Trees are ringed with telephone poles to dissuade the giraffes.

"It's altogether a different line of work," said Ray Michael, construction and maintenance manager. Michael and his 11-person staff are responsible for maintaining the existing buildings and supervising new construction. They're also responsible for knowing facts not in the mental storehouse of the ordinary person — like how high a baboon can jump (11 feet straight up and, if he's got the right footing, 15 feet horizontally). Gorillas can not cross the 15-foot-deep waterless moat that surrounds them, and they do have trouble climbing the smooth stucco plaster wall on the other side of the moat.

Those facts weren't quite as important when zoos were synonymous with cages. But these days, no wild animal in his right mind would want to escape from the San Diego Wild Animal Park. The gorillas, for example, have heated floors in their sleeping quarters and are fed warm milk every morning. "They're fed, they're cared for. Why would they want to leave?" asked Michael.

They don't. As a result, the park has become a major animal research center where many endangered species have reproduced. It is also a center for the animal lover. Visitors enter the park in the 17-acre Nairobi Village, which contains an Aviary, Petting Kraal, Animal Care Center, Congo River Fishing Camp, Gorilla Grotto, embarkation point for the Wgasa Bushline monorail and entrances to the Kilimanjaro Hiking Trail and Tropical America. The monorail takes passengers on a five-mile guided tour past social groups of various animal species; the hiking trail takes visitors on their own 1¼-mile East African safari, which affords a safe but close view of lions, tigers, cheetahs, giraffes, rhinos and other animals.

With all that, the park is less than half developed. Another 1,200 acres await the park's planners. But managing 1,800 acres still beats taking care of two continents. **WTT**

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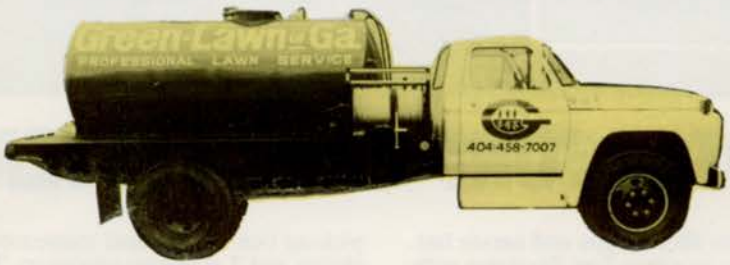

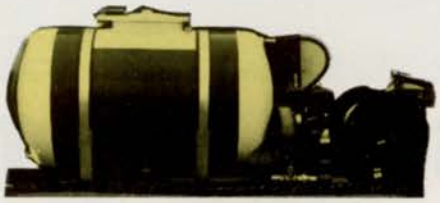

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The Land Reclamation Report

The newsletter of mine site restoration and revegetation of other disturbed lands.

September 4, 1978/VOL. 1, NO. 3

The Land Reclamation Report

The newsletter of mine site restoration and revegetation of other disturbed lands.

LAWSUITS

Almost all interim regs upheld; possible changes up to OSM

Industry had few reasons to celebrate over the holiday weekend since it was still suffering from the impacts of U.S. District Judge Thomas Flannery's August 24 decision that struck down most of its lawsuits challenging the OSM's interim regulations. The few bright spots in the lawsuit pertained to reclamation, but even some of those decisions were sent back to the Secretary of the Interior and OSM for further comment, with no promise of revision.

The only area where Judge Flannery has told OSM that the regulations must be changed pertains to prime agricultural farmlands.

Flannery struck down the clause in the farmlands regulation saying that any land used during five of the last 20 years would be placed in the prime farmlands category. Saying the regulations was "clearly overbroad in achieving its stated purpose" he has asked OSM to come up with a new definition.

There were some partial victories. Judge Flannery has required OSM to reconsider its rule on sedimentation ponds and dams that imposes a three-foot difference between the top of the dam and the surface of the water. But OSM was only asked to reconsider this since Flannery felt it did not document its reasons for the requirement in previous court briefs. He seemed to feel that the government should more or less double-check this since "these dam requirements are absolute and there is no variance procedure."

OSM will be given 60 days to reconsider some provisions that regulate the use of valley and head-of-hollow fill for spoil disposal. The judge asked the government agency to look again at this requirement only after West Virginia cited a March 1978 interim study by Skelly & Loy, the Harrisburg, Pa. engineering firm, which has determined much less costly methods in its report titled "Environmental Assessment of Surface Mining Methods, Head-of-Hollow Fill and Mountaintop Removal."

The judge also cited the study when asking OSM to review its regulations governing design criteria for underdrains and compaction of spoils in valley fills in lifts that are less than four feet thick. He also said OSM should "take into account" that West Virginia is considering variances in the latter requirement.

The final partial victory was won on the 100-foot buffer zone requirement around intermittent and perennial streams, an area considered "critical" by the Mining and Reclamation Council of America's Dan Gerkin. Here, too, the judge only asked OSM to reconsider since the reasons for its regulations were not stated in its court brief. Flannery said he would not enjoin its enforcement since it is reasonable, supported by state authorities and technical literature, and contains a variance procedure.

MONTANA LAND DISTURBED BY SURFACE MINING

MONTANA ACREAGE BONDED UNDER STRIP MINE PERMITS *

Industry was walloped in other areas. The court struck down Peabody Coal Company's challenge that lands improperly disturbed prior to mining must be restored to the premining use of surrounding lands after surface mining occurs. Flannery also said the regulations do not interfere with EPA's control over water pollution, meaning OSM can set up provisions for variance and exemptions on sedimentation pond design and waste treatment management.

Road gradient requirements and sections making companies cover toxic soil with four feet nontoxic material or provide treatment to prevent water pollution were upheld.

Finally, the court upheld the limited use of terraces and the design criteria, and the right of OSM to approve the terraces.

STATE GOVERNMENT

Illinois may set no time limit on farm productivity

No official word has yet been issued in Illinois on prime farmland regulations, but the state's Department of Agriculture says it will allow coal companies as much time as they need to grow crops that produce 90 percent or more of the yields than before mining occurred.

This word comes from Michael Williams, a reclamation supervisor in the Agriculture Department. He said the state doesn't fear poor cooperation since they will be holding some of the companies assets.

"As long as we have their bond, we're not that concerned," Williams said. "If they

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Total Exchange Cap.												
pH of Soil												
Organic Matter %												
Nitrogen Lbs./Acre												
Sulfates Lbs./Acre												
Phosphates Lbs./Acre (P_2O_5)												
Calcium Lbs./Acre												
Magnesium Lbs./Acre												
Potassium Lbs.Acre												
Sodium Lbs./Acre												
Base Saturation % Calcium (60-70%) Magnesium (10-20%) Potassium (2-5%) Sodium (.5-3%) Other Bases (Variable) Exc. Hydr. (10-15%)												
Salt Conc. ppm												
Chlorides ppm												
Boron ppm												
Iron ppm												
Manganese ppm												
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Zinc ppm												
TOTAL COST FOR MATERIAL PER ACRE												

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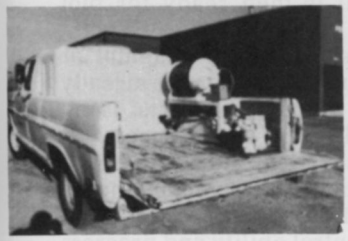

This basic spray rig is designed to fit in a pick-up truck, the tank situated between the rear wheel well and cab of truck. The motor, pump and hose reel on the right side leaving the remainder of the truck bed for other equipment and supplies.

Van pictured shows the basic spray unit in the van, leaving the entire rear area for storage of products.

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NEW JERSEY TURFGRASS EXPO '78 EMPHASIS ON TURF PRODUCTION

Co-sponsored by Cook College-Rutgers University and the New Jersey Turfgrass Foundation, New Jersey Turfgrass Expo is one of the largest state turfgrass educational programs and trade shows. Expo '78 was no exception. Total registration was 876 for two and a half days of educational programs and a trade show that included 59 exhibitors.

The educational sessions were planned largely for those with a professional interest in turf production. Wednesday sessions were of general interest, focusing on perspectives, insect, weed, and disease control. These subjects are of common interest and we have included abstracts of most.

Thursday, the sessions split up into groups interested in golf and fine turf, and those interested in athletic field, lawn, sod and utility turf. Some of these sessions are also abstracted.

Several awards were presented at the annual banquet on Thursday night. Two students received awards. The N.J. Turfgrass Hall of Fame Student Awards went to Christopher Carson, a four-year student, and David Johnson, a winter course student. The Hall of Fame Student Awards were made in honor of the late Jack Ormond, who was inducted into the Hall of Fame last year.

The Hall of Fame Award this year was presented to Wiley Miner. He has made many outstanding contributions to the sod industry.

The Metropolitan Golf Course Superintendents Association presented an award to Dr. Ralph Engel and Dr. C. Reed Funk for bentgrass variety improvement.

The N.J. Irrigation Association donated $2000 for an irrigation system for the Rutgers turf plots.

The N.J. Turfgrass association donated $1500 to Sami Ahmad for further research on grub resistance to insecticides.

They also put $5000 in an escrow fund for a turfgrass room on Rutgers campus. Plan is to add to this fund until it, and hopefully, matching funds from the university, accrue into a sufficient amount.

Following are abstracts from some of the many outstanding turf leaders who spoke at Expo '78.

Procedures of Pesticide Development

Ernie Koch, Stauffer Chemical Company

From initiation in a test tube, through EPA procedures, to the market place, a chemical goes through five years and 10 million dollars worth of testing for efficacy and safety.

A chemist initially comes up with a derived chain molecule that he feels may have potential. The first stage is planning. There must be a target and non-target market for it. Much of the planning is done on the blackboard.

The chemist then goes to the library to determine if his chain derivative is something the company holds a patent on. It might be something totally new or might infringe upon someone else's patent and cannot be further pursued.

If it can go ahead, then it must be determined in what form it will be used, wettable powder, emulsifiable concentrate, etc.

The chemical is tested against insects, plant disease and for herbicidal qualities. If it is to be an insecticide, it is tested on insects one by one, then in a mass test for LD_{50}.

If it is to be a herbicide, it is tested on cultivars, weed species, and other plants and categorized. Other formulations, or analogs, of the proposed chemical are also tested.

More of the material is made and chemists run tests to determine the most efficient rate. Equipment and methods of application must also be developed. The chemical is then ready for plot tests.

A chemical that comes on the ornamental or horticulture market is usually one that has already been through all of the agricultural tests, is an analog, or is being tested for an add-on use.

Test plots for the chemical must be small enough to glean good data, yet large enough to be tillable and workable. The chemical is tested on these large plots for its control ability and progress is plotted over a period of years.

Toxicity data is extremely important. Rats are initially used for oral toxicity data and albino rabbits for dermal toxicity. The material is sent to government laboratories for fish and wildlife toxicity data. It is also sent to universities to gather further efficacy data.

Biochemistry, that is, the metabolites and their routes, must be known before the chemical goes on the market.

Five years later, after all the testing, there might (or might not) be a safe, marketable, effective, pesticide.

Turfgrass Insect Control Update

Dr. Louis Vasvary, Extension Entomology Specialist, Cook College, Rutgers University

White grubs seem to be the highlighted problem, depending upon location and level of turf management. There are good insecticides appearing on the horizon.

Factors for control of grubs are: selection of chemical, depending upon the thatch layer; and a variation in location. The selection process in developing resistance is fairly precise and can occur over short distances. Precise timing is necessary.

The adult Japanese beetle feeds on over 250 host species. Where there are adults there are grubs. Periodic sampling as a normal procedure in a management program will help to keep ahead of the population. A low density population is easier

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to control.

In New Jersey and the surrounding region, August is the time to catch the grubs in their second instar stage. There is quite a size variation with the third instar, requiring heavier application rates.

Control with Dylox and Proxol have been consistent throughout New Jersey. Diazinon and Dursban do a good job where the organic matter and thatch is low. Milky spore disease, a natural control, works nicely at about 20 pounds per acre. The length between application and control is extensive, but control lasts up to three years.

Black turfgrass ataenius is somewhat a problem in New Jersey. Dylox and Proxol, with the same active ingredient, are the only labeled products.

Chinchbugs seem to prefer fescues and bentgrasses in the sunlight, but will attack Kentucky bluegrass with a heavy thatch layer. The brown grass resulting is not only a result of the chinchbug sucking the plant juices, but its toxic saliva. Aspon, Diazinon, Dursban, Ethione, and Sevin are some of the control insecticides. Application should be followed by one-half to three-fourths inches of watering-in.

Sod webworm controls are similar to chinchbugs and include Baygon. Timing is important as there are about five species of sod webworm in New Jersey and their life cycles tend to overlap. Watering-in is not critical and it is best, even, to keep the area dry for a half day or more following application. Same goes for cutworms.

Billbugs are fairly common in New Jersey. Programs against the adult stage have proved most successful so far. The billbug usually overwinters in the adult stage. However, it has been found overwintering in the last grub stage on some sod farms.

Application against the adult stage should take place in late April or early May. Diazinon and Baygon are registered.

Billbugs often occur together with white grubs. The billbug grubs can be differentiated because they have no legs beyond the head region.

Mound ants are a problem, particularly on some golf courses. They tend to prefer areas where there is uniform particle size in the subsoil. They maintain an aphid population that feeds on the roots of turfgrass and the mound ants themselves are not active during the day.

Control is difficult but is best when the mounds are disturbed and Diazinon, Dursban or Sevin used. Reapplication should be within two weeks.

Keeping accurate records of pesticide application, including for what, when, where, and how much will aid in diagnosing failures if the problem continues after pesticide application.

Studies of Japanese Beetle Grub Resistance

Dr. Sami Ahmad, Associate Research Professor of Entomology, Cook College, Rutgers University

This basic toxicology work was performed in light of the Japanese beetle becoming the major insect pest of turf across the Eastern Seaboard and its apparent resistance to the cyclodiene insecticides (aldrin, dieldrin). Organophosphates and carbamates were to be studied to determine their potential for development of resistance by the grubs.

Grubs, from a resistant population in River Vale, N.J., were individually isolated and insecticide applied. In these tests, dieldrin and an organophosphate insecticide, chlorpyrifos (Dursban), were to be compared.

Chlorpyrifos was applied to each grub at a rate of 20 micrograms per grub. Mortality peaked at four days and continued through seven. Because of this, the grubs were exposed for eight days and a final mortality rate determined. Dieldrin was similar except that the mortality continued for 14 days.

Symptoms of insecticidal poisoning of the grubs were determined. A healthy grub weighs about 220 milligrams. Once poisoned it loses body fluids until its weight is about half that. It has a yellow or brown color and is essentially paralyzed (moribund). Dr. Ahmad has adopted S for the shrunken body, Y for the yellow color, and M for the moribund state, developing a term for this condition: SYM.

It was found that the amount of chemical required to produce death of 50% of the grub population was normal. However, the amount required to produce death in 95% of the grub population was very high, for dieldrin about 1800 micrograms. Essentially the same was true for chlorpyrifos. This indicates a level of resistance in the population.

In another test, Dr. Ahmad tested adult beetles from a population with no apparent resistance to the chemicals and found that they were quickly killed. The River Vale population again proved resistant.

Bendiocarb, a carbamate insecticide, gave much the same results. Both have a similar mode of action and are metabolized by the same enzymes.

Dr. Ahmad's further research will attempt to determine if this resistance is widespread. He will also be working with insecticides with different modes of action.

Athletic Field Construction Procedures

Dr. H.W. Indyk, Extension Turf Specialist, Cook College, Rutgers University

Because of the increased use of athletic field facilities, there is a need to be more conscientious in constructing athletic fields.

Soil is basic. Compacted soil cannot be bypassed or good results will be short-lived. The soil should be prepared as a proper environment for seed.

In determining drainage characteristics, the physical properties of the soil should be taken into consideration. Poor drainage characteristically affects compaction. Turf should be aerified with a spoon-type aerifier and selective weed control used to remove the grass plants' competition.

Astroturf can be the right choice for a given situation. It takes a $300,000 initial investment however, and requires another $250,000 every three years to replace. Maintenance costs of astroturf are actually higher than for natural.

Solving problems inherent with an athletic facility calls for a "meeting of the minds" of all concerned, that is, those concerned with making decisions.

There are several things that can be looked at.

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Topsoil can be modified. A drainage system can be properly installed. Backfill should be some type of coarse material. Dr. Indyk noted one instance in which blue stone was used.

Proper grade is necessary to insure good surface drainage. It is also necessary to construct so that water can be added. Dr. Indyk strongly recommends an underground irrigation system.

Soil and sand mixing is best done off-site. A combination of lime and fertilizer should be incorporated after the soil is spread. Fine grading is then performed.

Seed or sod can then be added. Seed takes longer. Sod should be looked at at the farm. Insist on certified sod.

A new concept in athletic field construction, that of using 100% sand of a certain quality, is showing good, deep root growth. A drainage system is still installed and a good supply of irrigation water is needed.

Good sod grown on sandy soil should be used. Avoid sod with heavy-textured soil. Processed sod, with all soil washed off, is also very good.

One final point Dr. Indyk made was that the field manager should also be the one to decide how, and at what frequency, the field should be used.

Fertilization of Athletic Fields

Jerry Hutchinson, Turf Specialist, Holbrook, NY

A fertilization program is important to growing turf on an athletic field. Hutchinson's program includes 2 pounds of nitrogen per 1000 square feet in the fall along with 2,4-D at one pound and Banvel D at 4 ounces per acre.

Overseeding should be carried out after the last game. Then in spring, April through May, a fertilization program, preemergence crabgrass killer, and Banvel D at 4 ounces. 2,4-D is not applied in the spring as it seems to injure the turf.

A summer feeding includes 2 pounds of nitrogen per thousand and an insecticide for chinchbugs, Proxol for grubs.

Complete renovation of a field was carried out. A roadgrader prepared the grade at approximately $300 per day. It took about 2 days.

A mixture of 50% Kentucky 31, 25% Manhattan, and 25% Adelphi was spread over bare soil at a rate of 8 pounds per thousand. A modified Rogers seeder was used. It has 7 gauge blades on 3-inch centers. Milled spacers were added. The modified gear box makes the blades spin opposite the direction of the tractor wheels. The seed was applied twice at half-rates of 4 pounds in a crisscross pattern. A 16-4-4 starter fertilizer was used and the grass seemed to jump up.

In another seeding, the seed was put one inch down. A mixture of Citation and Warren's A-34 was used. Good root growth was observed six weeks after germination.

Hutchinson recommends Dachtal and has experienced no problems with Betasan, if the seed is up.

Lawn Disease Problems

Dr. Spencer Davis, Jr., Extension Specialist in Plant Pathology, Cook College, Rutgers University

Recognition is the primary factor in combatting turfgrass disease. The problem is often not disease, but competition, fertilization practices, or combinations of factors such as these.

A plant pathologist can always find disease fungi in a sample, however, they are often just there and not actually causing a disease problem. Brown spots in one case were diagnosed for disease, but it was found that the problem was letting clippings lie too long. Always look at the surroundings for possibilities other than disease.

A good field test for dollar spot was noted. A plug, pulled and placed in a jar for 24 hours, will show a white mycelial growth. The growth can also be noticed in the early morning dew.

Pythium can look like brown patch—but pythium chemicals won't work on brown patch. Recognition, again.

Winter Fertilization of Lawns

Dr. Ralph E. Engel, Turfgrass Research and Teaching, Cook College, Rutgers University

Winterkill of turf is greater when excessive amounts of fertilizer are applied just prior to winter. Work distribution can be enhanced and there is less chance of burn with dormant fertilization.

Some disadvantages of dormant fertilization include: some increase in leeching loss; early spring growth may not be necessary; and leaf spot disease may be worse.

Dormant fertilization is more useful on Kentucky bluegrass in areas of less severe winters. Dr. Engel still thinks fall season fertilization is best but would much rather see dormant winter fertilization than spring fertilization, especially in the New Jersey region.

Bentgrass makes a good response to dormant fertilization in December. *Poa annua* also responds better. There is really no data on fine fescue response.

Inorganic quick release forms of fertilizer are the best for a dormant program. They are normally applied at rates of 1-2 pounds, maybe 2½. The best, *Poa annua* free, dormant fertilization program was achieved with urea versus three slow release types.

A Successful Lawn Care Business

Robert H. Brewster, Consultant, Bellport, NY

The first point in maintaining a successful lawn care business, as most in the business are aware of, is educating the customer. One point to keeping a customer happy though, is to promise only what you can fulfill.

Rig men should be trained so that they are true representatives of your business. Be professional. A soil probe, hand magnifying lense, knife, etc., can help make you look professional.

The proper materials should be selected for each job. Proper scheduling and routing go with this. Timing application deadlines to include all customers within the time period is important.

Checkbacks are required after each application. Spot treatment equipment should be carried on checkbacks. Answering customer's complaints quickly and precisely can help keep them.

Anticipating seasonal problems can keep things

rolling smoothly.

Maintain individual customer records. Use three lawns of an area as guides. Monitor and evaluate them.

Comparing agronomist's calendars can help in anticipating application programs. Keep a rain gauge in your area of business. Precipitation can vary across town. Keep pest data, phenological data, weather data, and application dates.

Make rig men aware of things they may notice, pests, etc. Know the various species of grasses and pest hosts. Know phenological data.

A report may say spray a certain date for a certain pest. What if it is late that year? Flowering of Inkberry may provide an indication of when to spray for the second instar of Japanese beetle grubs. Queen Anne's lace, Rose-of-Sharon or Hydrangea in bloom may provide indications, depending upon what's in your area. *Kalmia latifolia* in bloom might be the best timing for a spring application to catch the last instar before pupae.

Seed Mixtures for Sod Production

Dr. C. Reed Funk, Turfgrass Breeding, Cook College, Rutgers University

Because of apomixis, a form of asexual plant reproduction, seed is being developed with genetic uniformity and hybrid vigor. A blend is defined as two or more cultivars of the same species. A mixture is two or more species.

In a test, two diseases, stripe smut and Helminthosporium leaf spot were introduced to turf plots.

On a Merion/Newport plot, the Merion was more aggressive and took over in a year. After three years it developed stripe smut. A Pennstar/Fylking plot has been good throughout six years of the test.

A blend of 38 bluegrasses was planted. The average performance was identical to the average of its components. In the last two years of the test, the best components have been gaining dominance. The performance of such a blend is determined by the varietal composition at the time of observation. It can change rapidly due to a change in composition, disease, insects, management or environment.

Weaker varieties only serve as dilutents. They add little or nothing to long term performance. Grasses similar in appearance, disease reaction, and growth cycle show no advantages or disadvantages, one over the other.

For best results, no aggressive component should have a serious weakness. A blend or mixture will sometimes perform only as well as its poorest component, however, it seldom performs better than its best component.

A blend or mixture should contain the best varieties available that complement each other. Blends are most normally successful in stress environments.

Dr. Funk recommended that ryegrass be avoided in New Jersey sod production. However, some of the fine fescues might be considered for certain uses.

Some of the newer chewings fescues, Highlight, Kokett, Jamestown and Banner, are more competitive with Kentucky bluegrass. Dawson and Golfood are good creeping red fescues. Ruby and Fortress are good spreading fescues. C-26 and Scaldis are good hard fescues.

Some good hard fescues are being found. Dr. Funk expects to see increased use of them.

The Future and Concerns of Recycled Water

Dr. Harry L. Motto, Associate Research Professor of Soils, Cook College, Rutgers University

The cost of water has risen from $17 per acre foot in 1957 to $90 per acre foot in 1977 (California figures). It is projected that water will cost $190 per acre foot by 1987. Because recycled water will be available in much greater supply and will cost about $3-4 per acre inch, it's use will be more feasible. The federal government is also now pushing land use in effluent disposal.

Waste water contains some 9 pounds of nitrogen per acre inch. The nitrogen is in highly available forms and is highly usable at low and continuous rates. At higher rates, it will probably leech to some extent.

Phosphorus is available at about 2.3 pounds per acre inch of effluent water. It's ratio to nitrogen is generally much higher than normal for turfgrass. It will also tend to build up, rather than leech.

Potassium is available at 3 pounds per acre inch and carbon is present at about 16 pounds per acre inch. The carbon level may be significant in building organic matter levels at the soil surface, but not in relation to the amount of carbon usually contained in most soils. The potassium level is adequate if the crop is not removed, but if it is, supplemental potassium may be necessary.

Range in pH is from 6.5 to 8.4. Amounts of zinc and copper do not present a problem, according to irrigation water standards, however, levels of manganese and iron might. Cadmium probably represents the biggest problem with inorganic compounds.

Salinity would not be a problem in areas where rainfall is adequate, but might in the more arid areas of the west. Boron is not generally a problem, but it is recommended that the specific source of recycled water be checked for significant levels.

Some pathenogens and viruses are present, according to the degree of treatment the water has received. Use of the turf will play a role in the amount of these organisms that may be present. Obviously, a sports area will have lower permissible levels than a non-use area.

Arrangements should be made in advance and contracted so that the party receiving the water knows just what is expected. It has happened that the water can't be shut off, even during periods of naturally high moisture levels. This can present a problem and one should be aware from the beginning. **WTT**

CONFERENCE PRESENTS INFORMATION ON WASTEWATER IRRIGATION

Use of effluent wastewater for irrigation is becoming a feasible alternative to paying higher water prices, expected to climb to unreasonable heights. Wastewater can also provide side benefits in the form of nutrients. The only drawback is that not enough information is being disseminated so that a prospective user can determine the economics and feasibility of using the effluent.

Golf course superintendents are especially concerned and have strong organizational support. They have again taken the initiative in holding a "state of knowledge conference on wastewater irrigation of recreational turfgrass".

An audience of over 80 gathered in Arlington Heights, Illinois, to hear officials, architects, superintendents, businessmen, engineers and agronomists brought together by the American Society of Golf Course Architects Foundation (ASGCA), the Golf Course Superintendents Association of America, the National Golf Foundation, and the United States Golf Association Green Section.

According to Richard Nugent, ASGCA, one of the most important aspects of developing a site is the water. For this reason, golf course superintendents in the Chicago area have approached the North Shore Sanitary District and are going to put turf plots there to see what happens to grass under these circumstances.

Nugent (ASGCA) was called in to help with design of the project, workers from Northmoor Country Club, which is nearby, are going to mow and take care of the plots and Dr. Al Turgeon of the University of Illinois is going to monitor them. A check, using potable water, will be run along side the effluent plots.

Organizational initiative is the key to projects such as this and they can be easily duplicated across the country, if properly done. In this case, local contractors and suppliers have also volunteered their help and are donating equipment.

Wastewater falls into three general categories, according to David Gill of the ASGCA. Ranked in order of those most difficult to predict and control, they are: 1) storm wastewater; 2) industrial wastewater; and 3) sanitary wastewater. In the order of difficulty to treat and use, industrial is first, sanitary second, and storm wastewater is the easiest.

A golf course using effluent will receive it at a constant rate, but not all will be used as it is received, Gill says. For this reason, storage volume can be used as a basis for making general estimates of feasibility.

By determining irrigation requirements and comparing them with availability, a system for making feasibility statements can be established.

An empirical formula established by Quackenbush in 1965 can be modified to compute irrigation requirements for lawn grasses. This formula basically states that the evapotranspiration less the

David Gill, ASGCA

amount of precipitation divided by 70 percent irrigation efficiency equals the irrigation requirement.

Based on this formula, Chicago fairways would require about an inch of water per week and greens and tees about one and one-half inches per week. Salt Lake City fairways would require two inches and greens and tees about two and one-half.

Figures should be designed to achieve the best quality turf and get the greatest efficiency from the effluent. The inflow rate depends upon water consumption and storage capacity. In determining the inflow rate, Gill uses the weekly water requirement, the length of the irrigation season and the length of the longest nonirrigation period.

These calculations resulted in the establishment of six zones. They cannot be ranked, but rather described, Gill says, because of many interacting factors. For example, zone number one, including southern California, Arizona, New Mexico and Texas, is not considered an effective zone. There is no storage problem there because irrigation can take place almost every day. Storage would only be needed for emergencies.

Storage would be minimal in semi-tropic areas. The plains and mountain states, on the other hand, would have high storage requirements. Zones 5 and 6, including the middle South, then North and Northeast, would have moderate to moderately high storage requirements.

Basically, what he has tried to do, Gill says, is to give an overview for more detailed local studies. There are many local exceptions to a general overview.

It is apparent that time might come when there is competition for available wastewater to irrigate with. When faced with what to do with theirs, Muskegon County Wastewater Management now uses it to irrigate 5000 acres of corn and harvests three or four hundred thousand bushels of corn every year.

Some of the crop gets 80-100 inches of water

continued on page 50

during the growing season at ¾-inches per day. The 1700 acres of lagoons also make a natural migratory bird haven. The Michigan Department of Natural Resources estimated there was 100,000 ducks on the lagoons at one time this fall.

While wastewater provides necessary water to the plant, it also has other elements in it that must be monitored to avoid a harmful buildup. Dr. Boyd Ellis of Michigan State University explained how industrial wastes affect some chemical properties of the soil. He gathered data from 59 treatment plants in Michigan.

The range in pH was 6.3 to 9.3 with a median of 7.5. Sixty percent of the plants had a pH near the median. The pH will change, according to Dr. Ellis, to that of the wastewater that is being applied.

In one example, in one surface soil, the pH rose from 4.4 to 6.6 in two and one-half years. The wastewater being used had a pH of 7.2-7.4. It may take one year, or ten, he emphasized, but it will happen and could lead to heavy metal deficiencies as they become tied up at higher pH's.

The amount of nitrogen ranged from 11-285 parts per million (ppm). The mean was 35, slightly higher than expected. The mean would be about right for Kentucky bluegrass and not too bad for bent. If you got on the low end, at 11ppm, the turf would only get about two pounds per growing season. On the high end, 285 ppm, it would get 47.8 pounds that might even do it in. You might be able to use it if you only applied it about three times during the season at one inch and then quit.

Phosphorus levels were low, .03-8.1 ppm with a mean of 2.2. It might not be too bad unless you were removing the clippings.

The thing to look out for is the extremes. Chromium, for example, had a mean of 2620 ppm which is not too bad because it precipitates in the soil. One sample had 99,000 ppm. Who knows what that might do.

The chances of drawing random effluent that would meet the average needs would be about one in three if you didn't bother to analyze it.

The cation exchange system is one of equilibrium, Ellis warned. You can't expect it to be a sink for all the bases you put in it. It will reach an equilibrium based on the properties of the water you're applying.

Watch SAR, or exchangeable sodium, values. Ellis recommends that SAR values should be less than five for turfgrasses.

In closing, Ellis offered five points to successful use of effluent. Establish the chemical composition of the wastewater you're going to use, before you use it. Find out if it is going to change (at the treatment facility).

Contract only when you can control how much and when you are going to apply it.

Carefully base your fertilizer program on the nutrient content of the soil and the nutrient content of the wastewater you're going to be using. Test the soil frequently.

Keep very close track of the sodium level in your wastewater and your soils. Don't let it become a problem. *Ron Morris* **WTT**

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VEGETATION MANAGEMENT

By Roger Funk, Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *A number of our clients had problems late this summer with browning needles on blue spruce. These trees were not recently transplanted, and I could not find any diseases or insects.*

A: It is very difficult (if not impossible) to diagnose a problem without seeing the plant. I can only relay to you the problems on blue spruce that were sent to our diagnostic lab in late summer.

Some herbicides will cause needle browning without also causing the needles to twist and curl. This is unlikely in your situation because of the apparent general nature of the problem, but it is one possibility.

Delayed symptoms of winter injury is another possibility. Although foliar injury is usually evident in the spring, the symptoms of root injury may be delayed until a drought occurs.

Cytospora canker is a fairly common problem on blue spruce. However, you should have noticed the bluish-white resin associated with Cytospora on at least a few of the trees.

We had a number of samples of blue spruce that were heavily infested with mites which you may not have seen unless you looked closely. The mites can be seen in the field with a 10X hand lens. The needles turned from yellowish-green to brown in a very short period. Apparently, applications of carbaryl for insect control killed the predators of mites and allowed a population explosion to occur, resulting in considerable browning and premature drop of the needles.

Q: *We had a lot of problems this year with crabgrass. Are the pre-emergent herbicides becoming less effective?*

A: Many areas in the Northeast and Midwest reported poor crabgrass control. However, I have not seen any evidence that the herbicides are at fault. We suspect that the delayed spring was partially responsible, but I'm still collecting data and talking with others in the lawn care industry and research for ideas. If any of the readers have suggestions, I will accumulate the information and report it in this column in the February issue.

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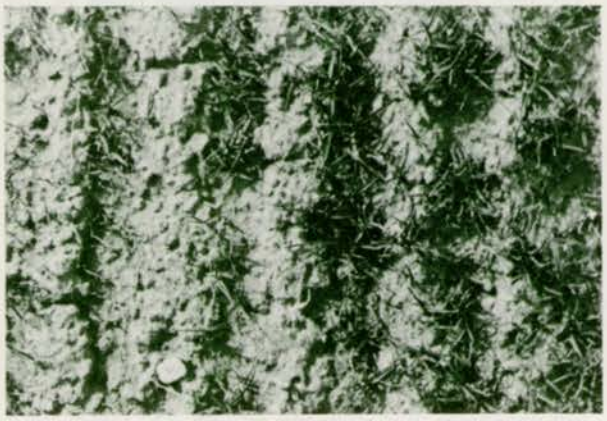
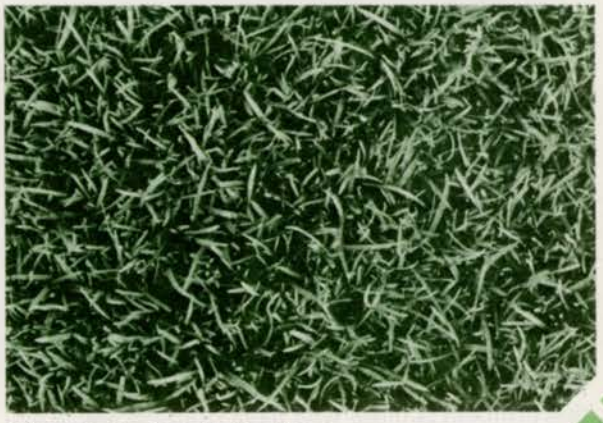
You can see for yourself. Just look at the difference between the two crops of turf pictured here. The picture on the left was taken of turf seeded by a conventional seeder. The picture on the right is turf seeded by the Meredith Seed Miser.



Turf seeded by conventional seeder.



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PROSCAPE

By Michael Hurdzan, Ph.D., golf course designer and consultant

Q: *We have planted our new sand greens to bentgrass but the grass is not growing. What should we do? F.B., Knoxville, TN*

A: The slow establishment of bentgrass on high sand greens is not uncommon and can be caused by several factors which results in an improper balance of air, water, and nutrient in the soil.

First, if the sand is of too coarse of particle size, then there are too many large pores and insufficient soil water is retained against gravity. Conversely, if your sand is too fine then too much water may be held not allowing enough oxygen to be retained in the root zone. The ideal soil mix should be 50% solid, 20% water and 30% air after gravitational draining. This ideal is usually approached by using sand commonly called Mason sand and with this general specification:

1) Not more than 10% (by weight) of particles over 2 mm size

2) At least 50% (by weight) of particles between 1 mm and .25 mm

3) Not more than 10% (by weight) of silt and clay particles

4) pH of between 6.2 and 7.0

When Mason sand is mixed with 20-25% organic matter (preferably peat humus), the mix is in the ball park for having proper physical characteristics. Even then newly seeded and mulched greens may have to be watered eight times a day for five to eight minutes on each cycle to have the proper moisture content to establish a green.

Another problem may be that your sand has chemical properties that limit plant growth such as an excessively high or low pH. In Ohio, almost all of our sands are of limestone parent material and hence have buffer pH's near 8.0. The opposite of this problem is those who have tried Fly ash, a byproduct of coal burning steel industry and generating plants, which may have a buffer pH near 5.0. Since these are buffer pH's and are nearly impossible to alter, the turf manager must adapt a management regime that keeps the soil water or soil solution in the proper pH range to support growth.

The first thing you should do is send a gallon of your sand to Agri-Systems of Texas, Inc., P.O. Box 3757, Bryan, TX 77801, for testing and explain your problem. Perhaps if the problem is a physical one they suggest a means of correcting or improving the situation. Meanwhile, adjust your water schedule so as to NEVER allow the SURFACE of the green to dry out.

Secondly, if your sand drains well, apply ¾ - 1 pound of N/1000 ft ^{2} per week (this spring) for 5 - weeks to replace the nutrient you leach out by the above watering practice.

Thirdly, apply a micro-nutrient solution on a weekly basis for the first three weeks and then every other week until you are satisfied with the turf color and growth.

Fourthly, apply only those pesticides which are absolutely required by evidence of a specific problem. Routine pesticide application can contribute to a decline in seedling growth.

Lastly, do not open the greens for play until the turf has knitted tightly and the plants have a strong tillering activity.

Q: *Our greens are primarily 1-1-1 (sand, peat, soil) mixture and poorly drained. What procedures would you suggest in hot weather particularly to develop deep rooting? Do you recommend light, frequent or less frequent, heavier watering? What about spring and fall care? K.D., Harlan, IA*

A: The management philosophy of most successful turf managers is to grow deep roots in the spring and fall and simply try to survive during the hot weather. This is especially true on poorly drained greens. However even this winter and spring you may take active steps to grow deep roots.

A good personal friend of mine who is regional agronomist for a large lawn care company has convinced me that fall and winter fertilization have great value. His contention, which is supported by some university research and personal observation, is that chemical (not organics or synthetic organics) fertilizer applied to turf on even frozen ground is not lost but is rather utilized by the plant anytime soil and air temperature will permit growth. Root growth seems to continue at lower temperatures than does top growth. Therefore, in a warm winter or cool spring root development may be taking place while top growth is barely noticeable. I would not be afraid to apply 1 -1½ of "N"/1000 ft. ^{2} of a farm grade material (10-10-10) in late November or early December if there is no snow on the ground. Then apply not more than 1 lb of "N"/1000 ft ^{2} of a slow release product in May. Apply only supplemental "N" in the summer in the form of organics just to survive. Next fall apply about 1 lb. of N/ 1000 ft ^{2} in early September and then back to the frozen ground application.

Secondly, I would suggest an aggressive topdressing program with a pure, washed, fine sand as outlined in the May 1978 issue of WTT. This will help improve your poor drainage and encourage deeper rooting. Lastly, spring and fall you should water infrequent and deep and in the summer try to stay on the dry side with light waterings.

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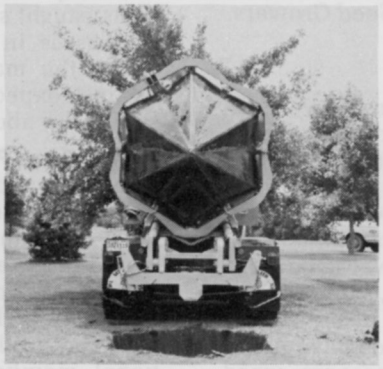

TS-84: Ball diameter, 84 in.; Ball depth, 54 in.; Maximum tree diameter, 8 in. tree trunk (approx.) Ball weight, 8,000 lbs. (approx.) *Available as a truck-mounted unit only.*

TS-66T: Ball diameter, 66 in.; ball depth, 48 in.; Maximum tree diameter, 6 in. tree trunk (approx.) Ball weight, 3168 lbs. (approx.) *Available as a truck-mounted unit only.*

TS-30: Ball diameter, 30 in.; Ball depth, 26 in.; Maximum tree diameter, 3 in. tree trunk (approx.) Ball weight, 355 lbs. (approx.) *Trailer or tractor-mounted units. Flat-bottom tree spade option.*

TS-20: Ball diameter, 20 in.; Ball diameter, 18 in.; Maximum tree diameter, 2 in. tree trunk (approx.) Ball weight, 109 lbs. (approx.) *Tractor-mounted unit, or in combination with Vermeer T-218 Trencher.*

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GRASS ROOTS

By Hal G. Dickey, North American Plant Breeders

A new commentary on the turf seed industry to appear periodically. Hal Dickey is active in turf seed associations and follows seed trade news carefully as part of his job at North American Seed Growers.

Turf Seed Yield Losses resulting from the wet September weather in the Pacific Northwest may carry over into next year's production. Growers are worried about increased disease risks in fields which didn't get burned. In Oregon where the normal burn would have been slightly more than 250,000 acres of grass seed fields, the wet conditions and harvest delays resulted in 100,000 acres not getting burned.

Field burning destroys seeds which have fallen on the ground. On the unburned acreages, weed infestations have therefore been more severe this winter and their control far more difficult than usual. Heavy crop residues and regrowth interfered with the effectiveness of normal herbicide applications. Weeds and volunteer crop seedlings must be controlled, of course, for a field to qualify for certification.

The autumn harvest reductions will cost Oregon's grass seed industry seven to ten million dollars in lost sales, according to estimates by the state department of agriculture. The September rains caught some of the later maturing perennial ryegrasses in the field. But worst hit were the bents, the majority of which move into export. Against expectations, the Penncross harvest was said to be about 70% normal.

PGMS Dues Policy Shift announced at the Professional Grounds Management Society's recent annual convention in Indianapolis is proving controversy in some quarters. The new ground rules would require members of local chapters, of which there are now fourteen, to pay dues simultaneously to the national group. Adding local-only members to the roster of present dues-paying national members would result in 960 members, roughly double the national level of recent years, it was explained. As set by the national board of directors, the combined dues will be $60.00 per year, $15.00 of which will be rebated to the local chapter. "We surveyed the chapters and found

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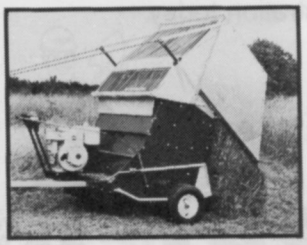

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their local dues average $15.00," said Allan Shulder, PGMS executive secretary from Pikeville, Maryland.

Mr. Shulder answered questions at the October meeting of the Kansas City PGMS. Of 130 members in that chapter, he estimated that possibly ten belong to the national. Reminding his audience that he came to Kansas City two years ago and personally assisted in getting that chapter organized, Mr. Shulder said the national program and image enhances the effectiveness of the local groups.

Critics argue that $60.00 dues will drive away many local members. "Half of our group consists of managers, officials, etc., who may be only indirectly involved with grounds management or have other areas of responsibility," one chapter officer told me.

Shulder said that ambitious national-level projects and inflation have forced PGMS to seek additional funds, which can best be raised by broadening the membership structure.

Key projects said to be nearing reality are an Apprenticeship Program for trainees and a Certification Program for professional grounds managers. If approved by the government, the work-study project would make federal training funds available to enrolled apprentices. The certification procedure, to be administered through local PGMS chapters, would consist of a test of the applicants' knowledge of the principals of ground management, the equipment, materials, financial management, environmental considerations, etc., as well as the filing of a Site Inventory. This would detail the facilities, vegetative species, operational programs and resources for which the applicant may presently be responsible.

How Many Turfgrass Varieties are you looking at these days? Visiting the Western Washington experiment station this fall, we found Dr. Roy Goss and his colleagues planting the last of their turf plots. They had put in 55 varieties of bluegrass, 45 perennial ryegrasses and 43 fine fescue cultivars. These plots comprise the Northwest Regional trial site at Puyallup and Dr. Goss pointed out that this region limits its entries to varieties on the market or whose commercial introduction is regarded as eminent.

Dr. Bill Daniels of Purdue University did an inventory of the turfgrasses in all their tests and observation plots. In bluegrass, he counted sixty named ones and fifty experimentals. Their perennial ryegrass entries consist of 32 named varieties, plus 20 experimentals. Finally, there are 78 fescues, including 60 red and chewings types, as well as some tall fescues with potential turf application.

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The WS-470 is equipped with two pumps, two nozzles, two fold-up booms and shut-off valves. It delivers a 72-inch fan of solution. Extra five-gallon containers are available. The container and unique ground-driven pumping system are made of corrosive resistant material.

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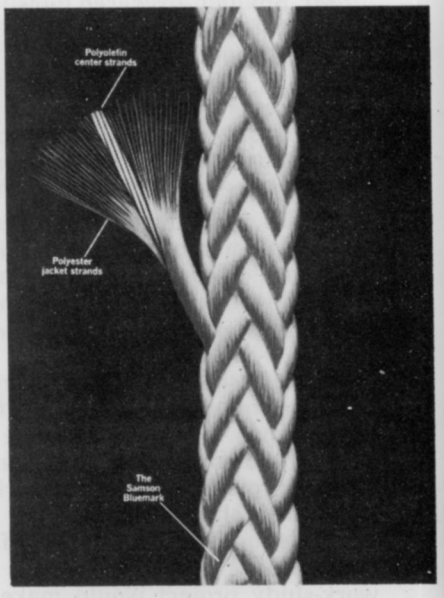

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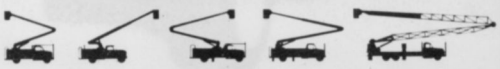

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Arbor-Plex™, a 12-strand, single-braided rope, has been developed by the Industrial Division of Samson Ocean Systems, for use in tree climbing and maintenance operations. Rope construction uses a combination of polyester and polyolefin fibers to provide extra strength, abrasion resistance, and low stretch, according to Samson Ocean Systems.

Polyester "jacket fibers" and Parallay™ fiber orientation resist abrasion from running over rough tree surfaces under load. The firm, round construction of Arbor-Plex also wears more evenly than "knuckled" 3-strand ropes.

The rope knots easily, is flexible even when new, and will not kink when thrown. Weighing 7.2 pounds per 120 feet, ½-inch diameter Arbor-Plex yields a strength of 6700 pounds, with low stretch, free from torque. It is available in ½, 9/16, ⅝, and ¾-inch diameters.

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Hemco Aluminum Running-Boards are available for pick-ups, vans and 4-wheel drive vehicles. The running boards keep vehicle sides clean and free from mud and rocks while providing easy access to cab and windshields. The kit comes complete with running boards, mud guards, hardware and instructions for easy installation.

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Olathe-Eskridge now offers a multi-purpose scarifier attachment for Olathe, Cushman, Toro or E-Z Go turf trucksters. The scarifier conditions athletic fields or can be used with a landscaper blade to level and grade areas.

The attachment is available with an electric hydraulic power pack or can be hooked directly to some hydraulic systems.

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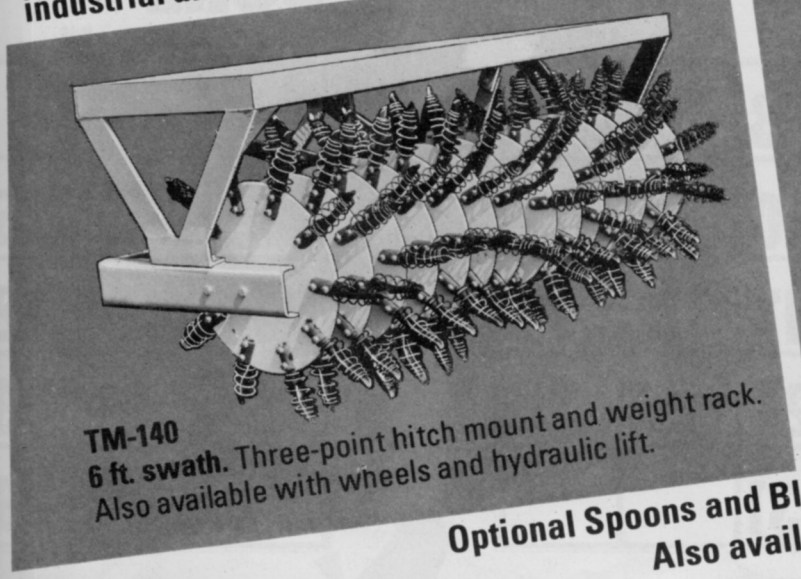

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4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

APRIL

SUN	MON	TUE
	2	3
8	9	10
15	16	17
22	23	24
29	30	

MAY

SUN	MON	TUE	WED	THURS	FRI	SAT
		1	2	3	4	5
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JUNE

SUN	MON	TUE
3	4	5
10	11	12
17	18	19
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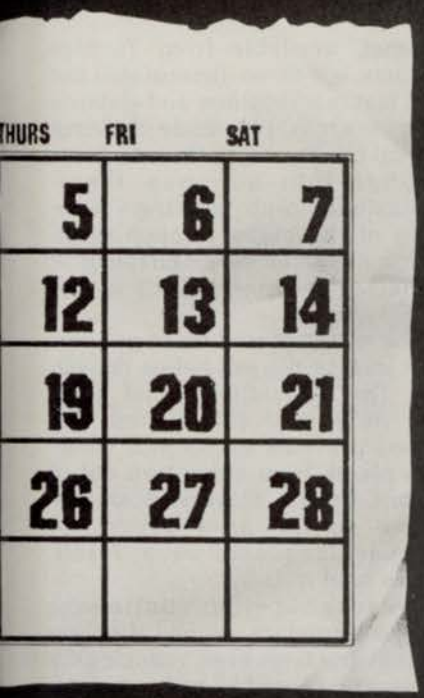

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The Ero-Con Machine is the latest design concept in equipment from Strong Manufacturing Company. It is designed to gently mix and spray-apply all varieties of mulch (wood fiber and cellulose), seeds, fertilizers and lime.

The machine features the Strong-patented Double Drum Contra-Blending mixer which yelds uniform blending into a homogenous slurry. Because of the gentle mixing action, seed damage is minimized.

Hydraulically driven, the Strong Progressive Cavity Pump produces necessary pumping pressures that allow spray ranges from 20 to 200 feet. The pumping rate can be varied from 10 GPM to 80 GPM, so that the pump can spray-apply a 1000 gallon load in 12 to 15 minutes. Mulch and water ratios as low as one pound of mulch (or mulch with additives) to one gallon of water can easily be mixed and pumped.

An important design aspect of the pump is that the hydraulic system allows it to be reversed by shifting the control valve. Should the machine become plugged, it can normally be cleared by running the pump in reverse. Or the hose pressure can be reduced to zero, eliminating blow-out under pressure. The reversal also allows loading water from creeks, ponds, etc.

The Ero-Con Machine is offered with a Ford industrial water-cooled engine as the standard power unit. Both the moxer and the materials pump are hydraulically powered. A recirculating valve is available as standard equuipment for additional mixing.

The machine is available in sizes ranging from 1000 gallon capacity up to 3000. The 1000 to 15000 gallon machines are offered trailer mounted, or on a skid for truck mounting. The 2000 and 3000 units are available only on skid for truck mounting.

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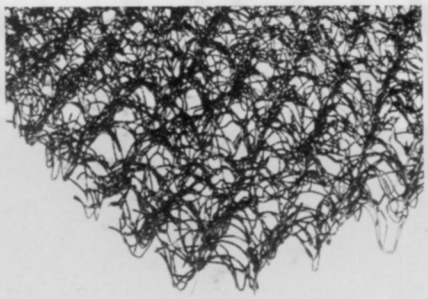

Enkamat, available from Turfibre Products, is a three-dimensional turf fibre mat to strengthen and stabilize turfgrass areas. It is made of strong, surgical quality nylon threads, fused together into an open three-dimensional web matting. Nine-tenths of its volume is open space. Environmentally safe, Enkamat is unaffected by humic acids or soil fungi.

The mat is placed three quarters of an inch in the soil below the surface. The three-dimensional structure, in a well established root system, prevents divots and whole grass plants from being torn out of the turf by the players. Scars are limited to the area above the Enkamat zone and, as a result, grasses heal quickly.

Because of the continuous Enkamat structure, weight distribution is over a large area, reducing the compaction caused by heavy maintenance equuipment.

Statistics drawn from established fields in Europe show that turf remained playable for more games. Maintenance costs were reduced drastically. On one soccer field, maintenance was reduced from 150 hours to only 11 hours. Another soccer field revealed an even greater reduction, from 218 hours down to 12.

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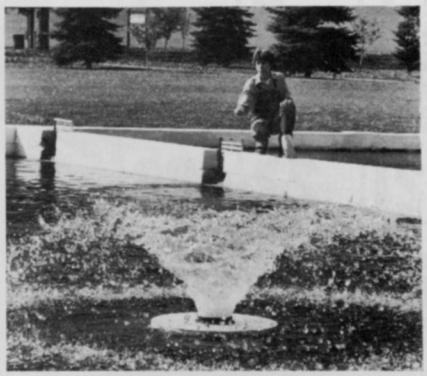

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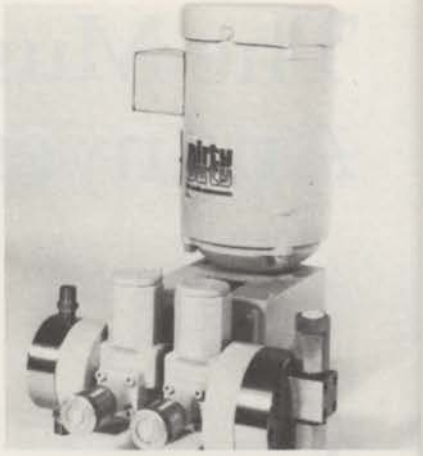
Cheminjector-D, a new concept in diaphragm metering pumps, is now offered by Hydroflo Corporation.



Three standard types are available, fluoroelastomer disc and tubular types and teflon disc type, are available.

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Continues on page 68

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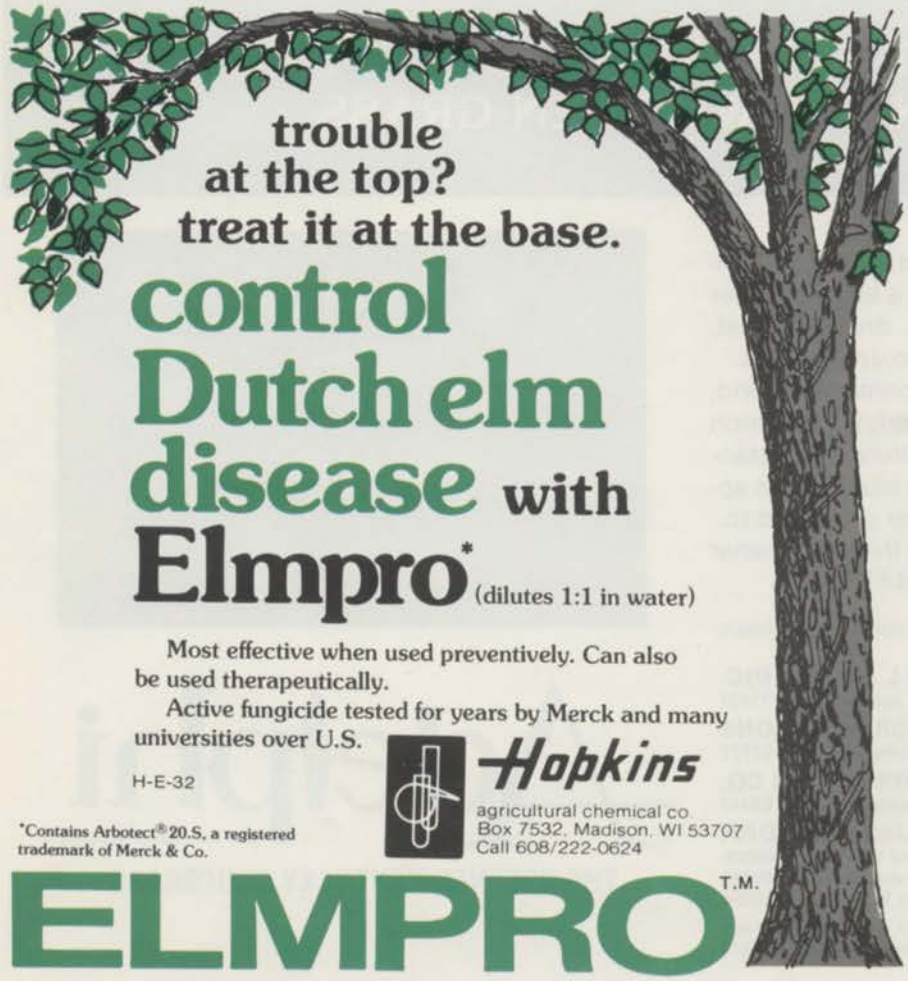

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EVENTS

Efficacy and Impact of Intensive Plant Harvesting in Lake Management workshop/research conference, Madison, Wisc., **Feb. 14-16.** Contact: Grant Cottam, Director, Center for Biotic Systems, University of Wisconsin-Madison, WARF Bldg., 610 Walnut, Madison, WI 53706, phone: 608/262-9937/0014.

National Arborist Association Annual Meeting, Marriott Hotel, Newport Beach, CA, **Feb. 18-22.** Contact: NAA, 3537 Stratford Rd., Wantagh, NY, 11793, 516/221-3082.

Capital Area Turf School, Hershey Motor Lodge, Convention Center, Hershey, PA, **Feb. 20-21.** Contact: Harold E. Stewart, 75 S. Houcks Rd., Ste. 101, Harrisburg, PA, 17109.

Landscape Design Short Courses, Fisher Auditorium, OARDC, Wooster, Ohio, **Feb. 21-23.** Contact: Fred K. Buscher, Area Extension Center, OARDC, Wooster, Ohio, 44691.

Penn-Del Chapter, International Society of Arboriculture, Holiday Inn Motel, King of Prussia, PA, **Feb. 22-23.** Contact: E. C. Bundy, phone: 217/328-2032.

Associated Sod Producers of America Financial Management Seminar, Doubletree Inn — Mall, Scottsdale, Ariz., **Feb. 23-24.** Contact: Bob Garey, phone: 402/463-5691.

Methods of Measuring Water in Soil, California State Polytechnic University, Pomona, Calif., **Feb. 24.** Contact: University of California Extension, Riverside, CA 92521, phone: 714/787-4846.

Southern Chapter, International Society of Arboriculture, Myrtle Beach Hilton, Myrtle Beach, SC, **Feb. 25-28.** Contact: E. C. Bundy, phone: 217/328-2032.

Annual Iowa Turfgrass Conference, Hilton Inn, 6111 Fleur Dr., Des Moines, IA, **Feb. 26-28.** Contact A. E. Cott, Ext. Horticulturist, Iowa State U., Ames, IA, 50011, 515/294-1870.

Northeastern Pennsylvania Turf School, Master Host Motel, Wilkes-Barre, PA, **Feb. 27-28.** Contact: Cy Chadwick, Ct. House Annex, 5 Water St., Wilkes-Barre, PA, 18702.

30th Annual Canadian Turf Show, Chateau Halifax, Halifax, Nova Scotia, **Mar. 4-7.** Contact: Canadian Golf Course Superintendents Association, 698 Weston, Rd., Suite 32, Toronto, Ontario M6N 3R3, phone: 416/767-2550.

The Irrigation Association Short Course Program, Turf Irrigation, Calgary, Alberta, Canada, **Mar. 6-8.** Call: 301/871-1200.

Reinders 4th Turf & Irrigation Conference — Equipment Show — Service Clinic, **Mar. 6-8.** Contact Ed Devinger, Reinders Bros., Inc., 13400 Watertown Plank Rd., Elm Grove, WI 53122, 414/786-3300.

Corrugated Plastic Tubing Association Annual Convention, Pier 66, Ft. Lauderdale, Fla., **Mar. 12-14.** Contact Robert Lowe, executive secretary, CPTA, 752 Leisure Lane, Greenwood, Ind., 46142, phone: 317/881-4552.

Midwest Turf Conference, Purdue University, West Lafayette, Ind., **Mar. 12-14.** Contact: Dr. William H. Daniel, Department of Agronomy, 2-443 Lilly Hall, West Lafayette, Ind., 47907, phone: 317/749-2891.

Canada Chapter, International Society of Arboriculture, Royal Connaught Hotel, Hamilton, Ontario, **Mar. 14-17.** Contact: E. C. Bundy, phone: 217/328-2032.

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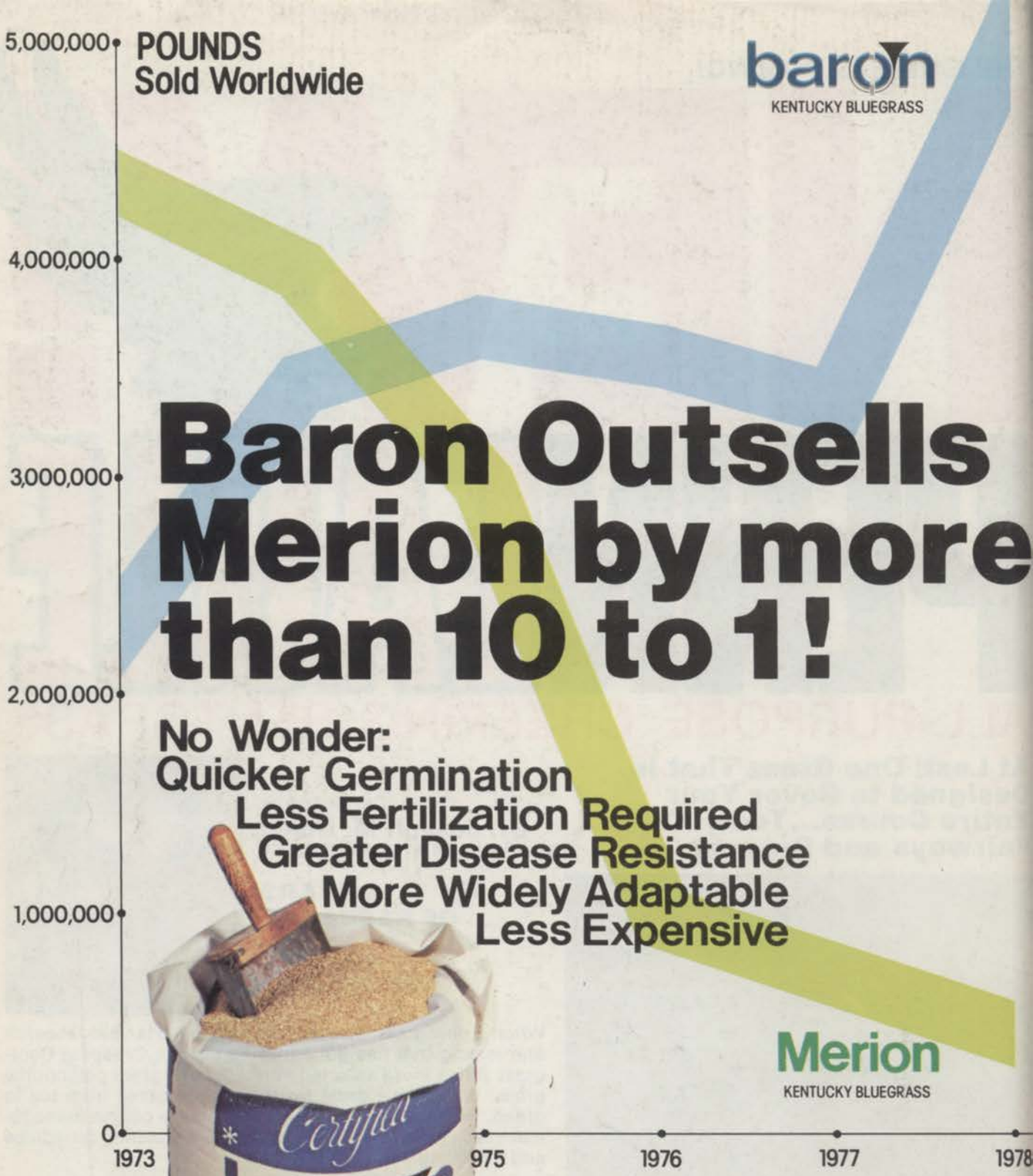

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